EXHIBIT H-4

From: Collision Sciences [jbayley@collisionsciences.ca]
on behalf of Collision Sciences <jbayley@collisionsciences.ca> [jbayley@collisionsciences.ca]
Sent: 5/3/2017 11:36:40 PM
To: Karpagam C.P [mailtokarpagamcp@gmail.com]
Subject: Re: Confidentiality Agreement
Attachments: Notes from other developer.docx

Thanks for signing. I look forward to your thoughts and hearing about where you feel you can help in the project, more the better!

Please first try and understand how the code functions, and think about advising me on how to get it in a professional working environment, and in a working state. I'd like to focus on getting the Toyota code to work first, for a few reasons, but mainly because I have a Toyota Prius that it worked on before.

A few tasks:
We need to set up some of the code on my server, get an android app (or web app) working with a bluetooth dongle, and get the files to be "played back" into the windows CDR software.

I've attached some project notes that were made by the other engineer throughout the course of the project, so you can understand what they were working on.

You can access my pc by downloading Team Viewer and using this info:
Team Viewer ID 715 899 611 and password 188cpe

There are a few others who have been granted access, so please just send me a quick note when you plan to use the pc, so that I can advise the others.

Fyi... my insurance platform will have an api and documentation; and this "telematics" code is somewhat documented, but what you see is what you get. You will have to dig deep into the folder "cdr and code related" as there are many files and folders, though many unrelated as well; the other engineer kept a lot of his random files on the hard drive.

Good luck.

Jason

On Wed, May 3, 2017 at 6:49 PM, Karpagam C.P <mailtokarpagamcp@gmail.com> wrote:
Hello Jason,

Take a look at the attached signed NDA. Let me know when you want to discuss further.

Thanks & Regards,
Karpagam C P

On Fri, Apr 28, 2017 at 9:26 PM, Karpagam C.P <mailtokarpagamcp@gmail.com> wrote:
Sorry Jason, thought it got drafted and not sent. Sure, will catch up at 11, its going to be an hour's travel.
Thanks!

Regards,
Karpagam.

On Fri, Apr 28, 2017 at 6:26 PM, Collision Sciences <jbayley@collisionsciences.ca> wrote:
You copied back the same message as before. Yes, that's fine.
I will see you both tomorrow at 11am and give you a tour. I'm near Lakeshore and Mississauga Road (1055 Shawnmarr Road, unit 192).

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Jason

On Fri, Apr 28, 2017 at 5:57 PM, Karpagam C.P <mailtokarpagamcp@gmail.com> wrote:
Hey Jason,

We are coming to meet a friend of ours in Brampton hence thought would visit your lab & set up. If thats not ok we can catch up some other time, not an issue.

Regards,
Karpagam C P
+1 647 554 5955

On Fri, Apr 28, 2017 at 2:22 PM, Collision Sciences <jbayley@collisionsciences.ca> wrote:
I am free let morning tomorrow. Would 11:00am-12:30pm work?

We would meet at 1055 Shawnmarr Rd, unit 192, Mississauga, ON.

Jason

On Apr 28, 2017 2:15 PM, "Karpagam C.P" <mailtokarpagamcp@gmail.com> wrote:
Hello Jason,

Thanks for the time and the opportunity offered.

How free are you tomorrow? If available, we thought, my husband & myself could travel down to meet in person in your office. Let me know.

Thanks & Regards,
Karpagam C P
+1 647 554 5955

On Thu, Apr 27, 2017 at 9:50 PM, Collision Sciences <jbayley@collisionsciences.ca> wrote:
Hi Karpagam,

Please take all the time you need with the NDA, including getting legal advice.

The opportunity I am offering to start is an independent contractor role for software review and development, reverse engineering if required, to get the project to a demo level, as discussed on the phone. The plan is to build a full time team for this project.

We can discuss a project budget and scope for the first milestone following your review of the project notes and source code. I do feel you will have a much better understanding of the project requirements and scope once you have an opportunity to review everything.

As soon as you sign and send the NDA back, I can provide in writing, project details and strategies at a much more detailed level.

https://en.wikipedia.org/wiki/Non-disclosure_agreement

Enjoy the weekend,

Jason

Jason Bayley
Director, CollisionSciences.ca
M: 1.905.599.9899
2680 Matheson Blvd E. Suite 102
Mississauga, ON Canada L4W 0A5

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Jason

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--

Jason

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Mississauga, ON Canada L4W 0A5

From: Renan Pedrosa [renanjpedrosa@gmail.com]
on behalf of Renan Pedrosa <renanjpedrosa@gmail.com> [renanjpedrosa@gmail.com]
Sent: 12/31/2018 12:34:58 AM
To: Jason from Collision Sciences [jbayley@collisionsciences.ca]
Subject: Invoice Oct 27th to Dec 20th - Renan Pedrosa
Attachments: Invoice - Oct. 27th to Dec. 20th.pdf

Hi Jason,

Good evening. Below is the invoice for the work done from October 27th to December 20th. It has the VPW CDR replay programming and the Honda K-Line tests inside.

Thanks!

Best regards,

--

Renan Pedrosa

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INVOICE

INVOICE # 1008 **DATE** 30/12/2018

MAILING INFO	**Renan Pedrosa** 80 Forest Manor Rd., Unit 1512 Toronto, ON, M2J 1M6 Phone: (416) 577-8158	**BILL TO**	**COLLISION SCIENCES INC** 192-1055 Shawnmarr Road Mississauga, ON, L5H3V2 Phone: (905) 599-9899
PAYPAL ID	renanjpedrosa@gmail.com		

DATE	DESCRIPTION	HOURS	RATE	AMOUNT
Oct. 28	Started the hardware setup for CDR Replay	1.00	$20.00	$ 20.00
Nov. 03	Finished setting up hardware and software for CDR Replay	1.00	$20.00	$ 20.00
Nov. 17	Programming VPW CDR Replay	3.00	$20.00	$ 60.00
Nov. 18	Programming VPW CDR Replay	9.50	$20.00	$ 190.00
Nov. 19	Finished main VPW CDR Replay code	2.80	$20.00	$ 56.00
Nov. 21	Fixed serial port read issues and finished first version of the code	2.75	$20.00	$ 55.00
Nov. 22	Bug fixing CDR read timeout when in VPW	4.50	$20.00	$ 90.00
Nov. 23	Finished bug fixing VPW CDR Replay. Code is now working. Fix was sending configurations without checking if the commands were successful.	1.25	$20.00	$ 25.00
Dec. 02	Setup Logic Analyzer and K-Line connections to Honda ECU	1.25	$20.00	$ 25.00
Dec. 03	Gathered data from Honda K-Line while reading CDR. Email test report compilation for contact with OBD Solutions	1.75	$20.00	$ 35.00
Dec. 19	Setup OBDLink MX+ and checked command acceptance. Tested Honda protocol with OBDLink. Wrote report for firmware update for Honda K-Line based on the results.	2.50	$20.00	$ 50.00
Dec. 20	Checked Airbag ECU connections, connected to Logic Analyzer and checked communication with CDR. Ford and Toyota K-Line ECUs gave CDR reports successfully.	1.00	$20.00	$ 20.00

	SUBTOTAL	**$ 646.00**
OTHER COMMENTS	**TAX RATE**	2.99%
1. Tax for PayPal using credit card is 2.99% + CAD$0.30.	**TAX**	**$ 19.62**
2. Please include the invoice number on your check	**DISCOUNT**	**$ -**
3. To pay via PayPal, send the total to renanjpedrosa@gmail.com	**TOTAL**	**$ 665.62**

Thank You For Your Business!

Make all checks payable to:
Renan Pedrosa

From: Jason from Collision Sciences [jbayley@collisionsciences.ca]
on behalf of Jason from Collision Sciences <jbayley@collisionsciences.ca> [jbayley@collisionsciences.ca]
Sent: 4/4/2018 5:28:32 PM
To: Chad Zinn [chad.zinn@collisionsciences.ca]; tomdom67@yahoo.com
Subject: Collision Sciences: Next Steps for Strategic Partnership

Hi Tom,

Thanks for talking through this strategic opportunity with Chad. Really appreciate your help on this and I look forward to working with you.

I've been working on a reference document to share our progress, AI research basis and current/future capabilities. Below is a brief summary and some references, but I can show you in more detail if we meet for coffee on Thursday.

Chad mentioned you were keen on the results of Martin's testing. I'm not sure you'll get the data you are looking for because he was not planning on comparing to appraisal or repair estimate data; however, I've referenced our comparable test data below and can share our database results; you can also see our database in the video link below. Martin was specifically interested in the Bosch PDFs. From his viewpoint, these reports require an engineer, costing $1k-$3k per use. From TDs viewpoint, consider that routine preservation of the same data at scale (for 70,000 claims/year) provides a relative annual value of $70-$210 million dollars avoided in engineering fees, where the data is available on demand.

Consider that if we can setup in the field collecting data for TD, we can provide these Bosch PDF reports, which represent the AI features, and are immediately available as a fraud flagging tool. Further, we would have the appraisal estimates and PDF emailed to your image desk. If we can begin a strategic relationship on this basis, where the repair estimate data is an ongoing development, that would be great (more details on this below also).

For us to prove our value, and progress, the next step is field/scaled access to more vehicles. A combination of direct testing and 3rd party use of the adapter would help flag potential problem vehicles. We have tested the app on about 100 real cars (but simulated about 1000 from the app to our web database, and 3000 in backend PDF simulation, and used 1000s of sample EDR reports on the NASS database). Access to cars is a challenge; we have relations with some used car dealers, but since we need to trade keys constantly, repower cars, it is quite time consuming, especially to find vehicles with stored crash data. You saw the CARPROOF results, these were a product of a month of testing, a few days per week. Having access to numerous body shops (directly or via their routine use of the adapter) or being on-site at a CRC is ideal for scaled access to post-collision vehicles (with keys available), and is imperative for our progress. But, while doing so, we could provide TD great value!

It sounds like you are interested in sample data for the Appraisal and Repair Estimate AI for the image desk. Right now, I'd consider the repair estimate AI good for fraud flagging, but it could easily be a "total loss' prediction tool, and more. If field testing is roadblock to partnership due to data privacy, could we work with TD's historical data to prove our value? For example:

1. If you'd like to test our appraisal/market valuation API and algorithms as compared to your historical appraisal data, we could do that for 50 cars? Just send me a spreadsheet with VINs and their mileage, and we can send it back, filled with our appraisal values for you to compare to your historical appraisal

data. Or if you provide the appraisal values in the spreadsheet, we can provide our valuations and a "confidence value" right away.

2. For the repair estimates, we could do the same, using historical data. You could have your team dig up repair estimate data from files with EDR Crash Data reports, where engineers were used. This process could be a test, but even better, it would help in data preparation for expediting the AI capability. Our AI currently utilizes simple scientific benchmarks and a linear scale; where the crash severity delta-v is linked to IIHS crash test repair costs (at two low impact test severities). Since, there are large variances in repair cost by vehicle model, the plan was to improve the AI with HLDI model-based claim severity data. Since TD have historical repair cost by vehicle model, and access to the EDR data for many files, we could work together to develop the repair estimate AI database, using trusted repair shop data. By linking delta-v to vehicle models at various damage levels, the repair estimate could be predicted with high confidence. Later, damage photographs can also incorporated to extend the AI to non-EDR supported vehicles.

3. Alternatively, maybe you have a good relationship with ADESA or COPART and could have them tow out lots of "post-claim" vehicles for us to gather data and test on, where data privacy should not be an issue.

TECH OVERVIEW

The tech has several components:

1. Ability to Collect Crash Data from the vehicle (app/adapter)

Live App Demo

Over 3000 unique year/make/models are supported, including most:
Toyota/Lexus/Scion(2003+), Chrysler/Dodge/Jeep/Fiat(2006+),
Buick/Cadillac/Chevrolet/GMC/Hummer/Oldsmobile/Pontiac/Saturn(2002+),
Ford/Lincoln/Mercury(2001+), Honda/Acura (2015+), Nissan/Infiniti(2012+), Mazda(2012+),
BMW(2013+), Volkswagen(2015+), Audi(2015+), Mercedes(2014+), RAM(2010+), MINI(2014+).
Coming Soon: Hyundai/Kia (2012+), Suzuki(2013+), Smart(2015+).

Simulation: simulated 3000 unique VINs, representing all makes/models

Real Car Testing: tested on approximately 100 real cars, view reports

2. Ability to analyze crash data in real-time (Python AI cloud server)

Current Function: reports in-app, EDR ClaimAlert PDF is a mockup and in development (alerts can be emailed), repair estimate data requires model-based data at various delta-v's

Current support:
Toyota/Lexus/Scion(2003+), Chrysler/Dodge/Jeep/Fiat(2006+),
Buick/Cadillac/Chevrolet/GMC/Hummer/Oldsmobile/Pontiac/Saturn(2010+),
Ford/Lincoln/Mercury(2010+), Honda/Acura (2015+), Nissan/Infiniti(2012+), Mazda(2012+),
BMW(2013+), Volkswagen(2015+), Audi(2015+), Mercedes(2014+), RAM(2010+), MINI(2014+).

Utilized NHTSA ftp site to decode 1000s of Crash Data Reports
Work-in-Progress : old Ford/GM vehicles

Google Sheets: Live AI Project Status

3. Ability to Replay the raw crash data into Bosch CDR Tool

Work-in-Progress: old GMs on VPW protocol
See live video of Raw Data fed into Scan Tool

Best Regards,

Jason Bayley, P.Eng.
CTO, CollisionSciences.ca
M: 1.905.599.9899
2680 Matheson Blvd E. Suite 102
Mississauga, ON Canada L4W 0A5
View My Calendar

From: Jason from Collision Sciences [jbayley@collisionsciences.ca]
on behalf of Jason from Collision Sciences <jbayley@collisionsciences.ca> [jbayley@collisionsciences.ca]
Sent: 12/7/2018 4:35:56 AM
To: Tom Walsh [tomdom67@yahoo.com]
CC: Chad from Collision Sciences [chad.zinn@collisionsciences.ca]
Subject: Re: Wawanesa follow-up... suggestions...?
Attachments: Sample Claims Report & Bosch CDR Report - 2017 RAM 1500.pdf; SIU Proposal - EDR Cost-benefit Analysis.pdf

Wow, thanks for the crucial feedback.

And yes Tom, I've spoken to lawyers, and can get a written opinion if it comes to that, but we would need to really dial in concerns. I think Wawanesa in-house legal can opine also...

Regarding privacy issues and access to data, nothing you don't already know- they just mean consent is a "best practice" and police require a warrant. Some makers haven't provided access to the data publicly, i.e. Porsche, Land Rover, Mitsubishi, Subaru.

I'm surprised to hear that about Jim... still not convinced heh. He directly asked me if we support Hyundai/Kia as well, that should have impressed him! Also quite disappointing, Jim was not keen to put this in the hands of appraisers because "he doesn't trust anyone". Frankly, fraud detection is important but claim efficiency is the best use case here.

FYI. I don't think Jim has enough experience with the Bosch tool to know how complicated usage and report Interpretation can be... I am attaching a document which outlines Bosch vs CS (and sample comparable reports).

Thanks for the notes Tom,

Jason

On Thu, Dec 6, 2018, 11:10 PM Tom Walsh <tomdom67@yahoo.com wrote:
Hi Jason thanks for sharing.

A few questions:

Did you obtain a legal opinion on the quote below? How do you know legally that CS falls under this exemption?
The *Digital Millenium Copyright Act* (DMCA) does not prohibit reverse engineering of diagnostic tools (there is an automotive exemption); and our tool also falls under an exception allowing reverse engineering, as an "inter-operable device for data exchange". Copyright laws are designed to protect creativity and promote innovation.

This says there are privacy issues, what are they? What has been the legal position on the privacy restrictions?

Auto makers still control access to the data through their proprietary encryption keys. The courts are now looking at whether the data should be more accessible, Lewis said.
Insurers in Canada rarely get access to black box data, said Pete Karageorgos, a spokesperson for the Insurance Bureau of Canada.
"There are privacy issues," he said. "And in any case, some dealers can only read their own products so again insurers can't access the data or they have to do it through the manufacturer."
I had a conversation with Dario the other day, he said you guys were talking with Jim Pletsis. Two things came from Jim's conversation with Dario, Jim thinks our tool is pointless since we can just use a Bosche

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tool. He sees no value in it at all. Also, Dario took it from his conversation with Jim that you guys were trying to get in through another connection. He hates that very strongly. I strongly recommend you remove the reference to the connection with Sue Cummings and Jim.
A brief e-mail can be sent to Sue that you are working with Dario, Elle and I on this. If she has any questions or wants to talk to us about it she can do so.

Tom

On Thursday, December 6, 2018 2:23 PM, Jason from Collision Sciences <jbayley@collisionsciences.ca> wrote:

Tom/Chad,

I feel this email is a good way to follow up - any suggestions?

Tom, if you can possibly help - we'd like to confirm the % of Wawanesa vehicles that run through the CRC. Dario thought it was low (10%), but SIU thought it was 80%. It makes a big difference for a potential strategy/pilot.

FYI the "profitability calculator" linked below is still being refined with the help of our new partners at LCM (Mark Weir, Scott McFie).

J

Hi Wawanesa team,

Thank you all for taking the time to meet with us. The following week we met a number of people from your SIU team who were very excited by our offering. Wawanesa SIU are proud to claim they are among the most capable teams in the industry. Sue Collings was in particular very interested in trying out a kit and also saw huge value with use through the CRCs (note that the team estimated 80% of their current referrals came through information from CROMs).

We are including some information herein that we hope will initiate a strategic relationship.

Elizabeth, thank you for the high level questioning and compliments. We are glad that you can appreciate the effort and value our solution can facilitate. The reports are evolving and you will be even more impressed in a few months with our upcoming AI which will predict detailed injury/outcomes and provide enhanced Recon calculations. In early 2019, we will also have an AI that ingests photos of damaged vehicles (with 100% vehicle support) to predict severity and injury outcomes. We are using over 1 million photos from 100,000 accidents from over 15 years of research, including 20,000 unique EDR data sets that were manually entered for the NHTSA studies (sample case data).

We want to assure Wawanesa that we have conducted our legal and IP due diligence and aim to provide any information or legal opinion as required. Please consider sharing the below research and strategy notes with Wawanesa legal for opinion:

Reverse Engineering / Copyright
As discussed in our meeting, there are a plethora of aftermarket reverse engineered tools (example), including "black-box" tools: EDR for heavy trucks and the Berla Infotainment Tool, where the full spectrum of EDR-type tools (licensed and not) are noted in this police presentation (slide 6).

Note there is case law to defend the reverse engineering manner in which we developed our diagnostic solution (Ford v. Autel). Further the EULA of the Bosch tool does not prohibit reverse engineering (possibly because these terms would not stand up in a court of law). The Hyundai tool does not actually have a EULA. The *Digital Millenium Copyright Act* (DMCA) does not prohibit reverse engineering of diagnostic tools (there is an automotive exemption); and our tool also falls under an exception allowing reverse engineering, as an "inter-operable device for data exchange". Copyright laws are designed to protect creativity and promote innovation.

Data Ownership / Competition Act

While OEMs have argued, and are known to "own" most of the data on their vehicles, there is one fortunate exception: "black-box" data is owned by the vehicle owner (or lessee), with precedent through the US via the Driver Privacy Act and in Canada (according to court decisions, per Canadian Safety Council source). While there is always the risk of changing technology, the CS solution does and will continue to support all current on-road vehicles which have an average predicted life of 23 yrs (Ex. 70% of the 289 million registered vehicles in North America). We have been considering our legal options; such as an injunction through the competition tribunal on a "refusal to deal" basis, which would likely mandate licensing. Though thinking strategically, this also opens the doors to competitors. Note that Autel successfully sued and settled with GM for a similar antitrust/anti-competition dispute. Ideally, CSI are eventually licensed officially and/or have the revenue and support of insurers who realize the importance of access to this data, to confidently proceed with competition type action. We have a 3-year head start, but are eager for support and traction first. We are at a cross-roads as to whether we should be proactive or reactive regarding licensing the data via OEMs directly, and are open to direction and cooperation from Wawanesa legal.

Dario, we've put some thought into your comments about a potential strategic partnership. We agree that Wawanesa is a unique insurer and would provide CS a cross-border opportunity. If given the opportunity, we would work very closely with your team to apply the best use of our quantifiable data and reporting. Our goals are aligned; we want to make you and Wawanesa look good, because it will make us look good also. Our product was confidently designed with no other purpose than to cut loss costs and expenses; and it will do so many ways. We do feel that expedited and accurate settlements (reducing IBNR) will reveal the greatest value, while also providing crucial flags and indicators for some files. We are confident this is the product Wawanesa needs to get out of the red. Please check out this customizable "profitability calculator" tool, which presents projected savings on a per claim basis, where data is collected for the collision claim, but potentially applicable to all subsequent claims (AB, 3PL). Please let us know if there's anything we can do to help you sell this internally. We are open to creative options to get started.

Best Regards,

Jason Bayley, P.Eng.
CEO/Founder, CollisionSciences.ca
M: 1.905.599.9899
2680 Matheson Blvd E. Suite 102
Mississauga, ON Canada L4W 0A5

Collision Sciences *CLAIMS REPORT*

EXPOSURE, RISK & DECISION SUPPORT

Vehicle: 2017 RAM 1500
VIN: 1C6RR7MT2HS******
Report ID: #2518
Generated: 2018-10-01 19:00:42

REPORT SUMMARY

This section provides an overview of the predictive analytics used for the estimation of claim severity, exposure, and fraud risk for the most recent crash or event sequence.

Repair / Loss Exposure	The vehicle is predicted to be repairable.
Occupant Injury Risk	1st Party: Medium Risk, Transient Neck Injury 3rd Party (if any): Medium Risk, Transient Neck Injury
Max Recorded Speed / Impact Speed	Within the 5.0 seconds of recorded pre-impact data for the most recent crash, the maximum recorded speed on this vehicle was 98 mph. The vehicle speed was 68 mph at the moment of impact.
Flags / Loss Indicators	Medium Risk (2 Alerts): Steered-To Sideswipe, Possible Intentional Damage
Recommended Action / Notes	Expedite Settlement / Treatment. Compare pre-crash data to reported circumstances. Evidence of Dangerous Operation / Criminal Negligence.

CRASH DATA RECORDS

This section lists crash data records stored on the vehicle's event data recorder. The date of crash data collection was 2018-06-08.

Recency / Sequence	Crash Severity	Type	Sudden Speed Change	Impact Angle	Engine Starts Since Event
Most Recent (1st Impact)	Moderate, Low-speed Impact	Left Side Impact. Rollover Pulse.	6 mph	276 degrees (9 o'Clock)	8
Most Recent (2nd Impact)	Moderate, Low-speed Impact	Frontal (Right)	-9 mph	30 degrees (1 o'Clock)	8

How To Interpret This Information

The crash severity (acceleration / g-force) measured by the airbag module accelerometer reached a maximum value of 9 mph within 250 milliseconds, which is considered "moderate" in terms of severity. Damage occurred on the left side of the vehicle. The vehicle's ignition was turned on 8 times between the incident and crash data download; this number can be used as an indication of event recency.

PRE-CRASH DATA / Most Recent (1st Impact)

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Vehicle Speed (mph)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Switch Status	Steering Angle (deg)
-5.0	88	4875	100.0	Off	12.0 (Left)
-4.5	89	4978	100.0	Off	-15.0 (Right)
-4.0	91	5095	77.0	Off	-15.0 (Right)
-3.5	98	5432	100.0	Off	0.0 (Straight)
-3.0	96	5251	0.0	Off	44.0 (Left)
-2.5	88	4869	8.0	Off	16.0 (Left)
-2.0	84	4586	0.0	Off	-70.0 (Right)
-1.5	77	4217	0.0	On	-130.0 (Right)
-1.0	71	3944	0.0	On	-160.0 (Right)
-0.5	65	3654	0.0	On	-190.0 (Right)
-0.1	68	3754	0.0	On	-172.0 (Right)

PRE-CRASH DATA / Most Recent (2nd Impact)

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Vehicle Speed (mph)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Switch Status	Steering Angle (deg)
-5.0	61	3366	0.0	On	-221.0 (Right)
-4.5	57	3081	0.0	On	-98.0 (Right)
-4.0	54	2929	0.0	Off	11.0 (Left)
-3.5	49	2690	0.0	Off	39.0 (Left)
-3.0	42	2274	0.0	Off	50.0 (Left)
-2.5	33	1821	0.0	Off	-32.0 (Right)
-2.0	26	1405	0.0	Off	-50.0 (Right)
-1.5	36	878	0.0	Off	-86.0 (Right)
-1.0	33	637	0.0	Off	-192.0 (Right)
-0.5	22	313	0.0	On	-208.0 (Right)
-0.1	12	0	0.0	On	-233.0 (Right)

SEAT BELT & AIRBAG STATUS (Most Recent Crash)

This section lists the restraint system status at the time of the event recording, including airbag deployment status and the seatbelt buckle insertion status for supported seating positions.

- ✔ Known number of occupants: 1. Front passenger seat occupancy status was "Unknown".
- ✔ Seatbelt Circuit status for the driver was "Buckled". Front Passenger: "Unbuckled".
- ✔ Frontal Airbag status for the driver was "Not Deployed". Front Passenger: "Not Deployed".
- ✔ Side Seat Airbag status for the driver was "Deployed". Front Passenger: "Not Deployed".

✔ Side Curtain Airbag status for the driver was "Deployed". Front Passenger: "Not Deployed".

FLAGS / LOSS INDICATORS

This section lists flags for further investigation based on known anti-fraud indicators and/or inconsistencies with reported circumstances.

Indicator	Description	Flag / Risk Alert
Drive Down	Frontal collision where the driver accelerates up to impact, with no pre-impact brake application.	No
No Avoidance Maneuver	No driver input for either brake or steering maneuver within the 2.0 seconds prior to impact.	No
No Pre-Impact Speed Reduction	Brake is only applied lightly with no meaningful reduction in speed.	No
Steered-To Sideswipe	Driver steers either left or right, causing an impact on the steered-to side.	Yes
Swoop & Squat	Driver steers to make a lane change and quickly applies brakes.	No
Panic Stop	Rear-end collision where driver brakes just prior to impact.	No
Past Posting	Accident recording may not be recent. Event data recorded 10 or more engine starts prior to data retrieval.	No
Possible Intentional Damage	Event data recorded on successive engine starts (sequential ignition cycles), or multiple events recorded on the same ignition cycle, where pre-crash data does not overlap.	Yes
Pre-Damaged Vehicle	Evidence of prior accident damage, where event data was recorded 25 or more engine starts prior to the count at crash data retrieval. Possible issues include: Unrelated Damage to Incident, staged Hit & Run, Phantom Accident, or Paper Accident.	No

Reported Circumstances

The flags in this section are generated through cross-referencing provided information (if any).

Indicator	Description	Flag / Risk Alert
Reported Number of Occupants	Compares the reported number of occupants to the available seat sensor data.	N/A
Reported Vehicle Speed Variance	Compares the reported travel speed and/or impact speed with the pre-crash data and flags a variance of 6 mph.	N/A
Reported Pre-impact Maneuver Variance	Compares the reported pre-impact motion with pre-crash data and impact angle for consistency.	N/A
Reported Appraisal Variance	Compares a provided appraisal estimate with the AI estimate and flags an appraisal variance of +15%.	N/A
Reported Airbag Deployment Variance	Determines whether airbags were manually removed to exaggerate damage by comparing recorded airbag deployment status.	N/A
VIN Mismatch	Compares the VIN diagnostically retrieved from the vehicle to the the VIN sticker or provided VIN. Requires claim reference number.	N/A
Image Integrity	Utilizes algorithms to identify digitally edited or altered parts in provided photographs.	N/A
Pre-Accident Vehicle	VIN identified in online classifieds within the last 6	N/A

Sale Attempt	months.

1ST PARTY / INJURY SEVERITY & DURATION

This section predicts occupant injury risk for WAD (Whiplash Associated Disorder) and MAIS2+ (Maximum Abbreviated Injury Scale - moderate/serious) injury for frontal/side/rear collisions using a regression model of crash severity versus reported injuries from real-world crash studies using event data recorders.

Occupant Detail	Risk of Initial WAD Symptoms	Risk of Long-term WAD Symptoms	Risk of Serious Injury
Occupants in Frontal Impact	24% (Possible)	9% (Unlikely)	1% (Improbable)

How To Interpret This Information

With a high risk of whiplash or other injury, the claim can be expedited. Early treatment is often effective in providing the best probable outcome for patient recovery.

The injury prediction is based on the actual incidence rate or proportion of injury in tracked studies using data from real-world outcomes. The most important factor in predicting the risk of injury or death in a vehicle crash is the crash severity, which is expressed as the velocity change, or Delta-V, experienced by the vehicle during the crash. The Crash Investigation Sampling System (CISS) is the largest database in the world with over 100,000 cases linking injury outcomes with Delta-Vs, which are obtained from field reconstructions. The effects of occupant age, gender, and belt use on injury and fatality risk have been found substantial.

RELATIVE INJURY RISK / 3RD PARTY EXPOSURE

This section provides a lead indicator for relative 3rd party injury risk based on accident reconstruction principles including conservation of momentum and relative vehicle mass (Delta V2 (Change in velocity) = Delta V1 * M1 / M2). The calculation does not require the vehicles reach a common post-impact velocity.

Assumed 3rd Party Vehicle	3rd Party Vehicle Delta-V / Severity	3rd Party Injury Risk	3rd Party Vehicle Speed
Avg Compact Car (1815 kg)	8.92 mph	Medium Risk, Transient Neck Injury	N/A
Avg Midsize Car (2260 kg)	7.16 mph	Medium Risk, Transient Neck Injury	N/A
Avg Van/SUV/Light Truck (2720 kg)	5.95 mph	Medium Risk, Transient Neck Injury	N/A
Avg Full Size Truck/SUV (3630 kg)	4.46 mph	Low Risk, Whiplash Unlikely	N/A

RECALLS / SAFETY / DIAGNOSTIC SCAN DATA

This section lists any outstanding recalls, known safety ratings & issues, retrieved DTCs (Diagnostic Trouble Codes), and respective Freeze Frame impact data, if any.

Safety Recalls

Vehicle safety recall information is received from Transport Canada and includes all known recalls associated with this particular vehicle model.

Recal Date: 2017-03-23
Recall Number: 2017167
Affected System: Powertrain
Description: Certain vehicles may have a loose differential pin retaining screw. This could damage or lock up the rear axle differential, resulting in a loss of motive power which would increase the risk of a crash causing injury and/or damage to property.
Correction: Dealers will inspect and replace the differential pin retaining screw as necessary. If the inspection reveals that the retaining screw is loose or damaged, the rear axle assemble will be replaced.

Recal Date: 2017-12-21
Recall Number: 2017659
Affected System: Powertrain
Description: On certain vehicles equipped with a steering column gear shifter, the brake transmission shift interlock (BTSI) may become inoperative. This could allow the steering column gear shifter lever to be shifted out of the PARK (P) position without depressing the service brake pedal or having the key in the ignition, which could result in unintended vehicle movement, increasing the risk of a crash causing injury and/or damage to property.
Correction: Dealers will inspect and replace the BTSI as necessary. The Body Control Module (BCM) will also be updated.

Recal Date: 2018-02-08
Recall Number: 2018081
Affected System: Powertrain
Description: On certain vehicles equipped with a steering column gear shifter, the brake transmission shift interlock (BTSI) may become inoperative. This could allow the steering column gear shifter lever to be shifted out of the PARK (P) position without depressing the service brake pedal or having the key in the ignition, which could result in unintended vehicle movement, increasing the risk of a crash causing injury and/or damage to property.
Correction: Dealers will inspect and replace the BTSI as necessary. The Body Control Module (BCM) will also be updated.

Recal Date: 2018-05-17
Recall Number: 2018269
Affected System: Engine
Description: On certain vehicles, an electronic fault may create a situation where the cruise control cannot be deactivated. If this occurs and the driver does not apply the brakes or shift the transmission to neutral, the vehicle could maintain speed or accelerate without warning, increasing the risk of a crash causing injury and/or damage to property.
Correction: Dealers will inspect the Powertrain Control Module (PCM) software and perform an update as necessary.
Note: In the interim, owners are advised not to use the cruise control until the vehicle is repaired.

Recal Date: 2018-07-31
Recall Number: 2018398
Affected System: Structure
Description: Certain trucks equipped with a power locking tailgate may experience unintended opening of the tailgate. If this occurs while driving, unrestrained cargo could fall out of the box and create a road hazard, increasing the risk of a crash causing injury and/or damage to property.

Correction: Dealers will modify the locking mechanism.

IIHS Crashworthiness / Safety Ratings

Insurance Institute for Highway Safety (IIHS) in the US publishes vehicle safety ratings based on actual crash tests. In each category, the possible ratings are: Good, Acceptable, Marginal, and Poor. Further vehicle research on safety ratings and features, reviews, tips and more can be found here: www.iihs.org/iihs/ratings.

Frontal Small Overlap	Marginal	**Side**	Good
Frontal Moderate Overlap	Good	**Rollover**	Marginal

Diagnostic Trouble Codes (DTCs)

Diagnostic Trouble Codes (DTCs) are set by a control module when it detects faults in its system through self-diagnostics. The following section lists DTCs retrieved from various control modules of the vehicle.

Engine Control Module (ECM)	No Issues Found
Transmission Control Module (TCM)	No Issues Found

Freeze Frame Data

Freeze Frame Data refers to a snapshot taken by a control module when it detects a fault in its system. The snapshot consists of measured values from various sensors and can be useful in determining the root cause of the fault. Note that not all vehicles support the items listed below and thus some values may be inaccurate.

No freeze frame data for DTCs (Diagnostic Trouble Codes) were retrieved from the ECM (Engine Control Module) or TCM (Transmission Control Module).

MARKET VALUE

This section provides an estimated market value for 2017 Ram 1500 Sport. Estimate based on 178 similar vehicles sold between 2018-04-12 and 2018-08-23 within the range of USD $37,120.68 - USD $42,840.68.

Assumed Milage	Market Value	Time Period	Estimate Certainty
16,187 miles	USD $39,980.68	6 Months	99%

EXPOSURE / AUTO PHYSICAL DAMAGES

This section provides predictive loss and repair estimate/cost information. AI Inputs: Trusted Repair Estimates, Max Delta-V, Impact Angle, Vehicle Model/Specs (weight, stiffness), Airbag Deployment status, DTCs, Damage Area/Level/Photographs (if any).

Repair Estimate (AI Prediction)	Salvage Value (80% of Market Value)	Prediction: Total Loss / Repairable	Estimate Certainty
USD $28,588.60	USD $31,984.54	Likely Repairable	94%

How To Interpret This Information

The vehicle is predicted to be repairable. The algorithmic repair estimate is less than the estimated salvage (as damaged) value of the vehicle. The algorithmic repair estimate for this prediction considered "total repair estimates" from similar vehicles, with similar recorded impact configuration and severity, also requiring airbag replacement. Photographs of the damaged vehicle were not used to generate the prediction.

The repair estimate does not replace a physical damage appraisal. Collision Sciences is working with strategic partners to develop an advanced repair cost prediction algorithm using a combination of photo-based estimating, diagnostically detected impact configuration and severity, and diagnostic issues requiring repair. The repair estimate may currently be used to predict a total loss or repairable condition, identify potentially exaggerated repair estimates and provides a contextual frame of reference for claim severity.

VEHICLE SPECIFICATIONS

This section lists basic vehicle details encoded by the VIN

VIN	1C6RR7MT2HS664236	**Year**	2017
Make	Ram	**Model**	1500
Trim	Sport	**Engine**	5.7L V8 OHV 16V
Made In	United States	**Style**	Crew Cab Pickup (4-Door)
Steering Type	R&P	**Anti-Brake System**	4-Wheel ABS
Fuel Type	Regular Unleaded	**Fuel Capacity**	26 gallon
Overall Length	N/A	**Overall Width**	N/A
Overall Height	N/A	**Standard Seating**	5
Curb Weight	N/A	**Gross Weight**	6800
Highway Mileage	23 miles/gallon	**City Mileage**	16 miles/gallon
Invoice Price	USD $40,353	**MSRP**	USD $43,895

Event Data Disclaimer

It is important to note is that if a vehicle was spinning or rolling surrounding the collision, then the report's speed measurements would not accurately reflect the actual speed of the vehicle during/after it lost control; the speed measurement is typically based on the wheel speed sensor. Signs of this type of anomaly would be rapid changes in speed between the brief timing intervals. The reported speed may be an average of the four wheels; thus could also be skewed by spinning wheels. In combination with scene evidence, an expert could assess vehicle speed by analyzing the data via accident reconstruction and engineering analysis.

Users of the Collision Sciences service and reviewers of the reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Collision Sciences Inc. and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Collision Sciences Inc. expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the online services, evidence logistics, EDR data, EDR software or use thereof.

Injury Risk / Biomechanical Assessment Disclaimer

The estimated injury risks are calculated based on the recorded crash pulse, relative energy changes, known vehicle characteristics in standardized and real-world crashes, published databases, and recognized studies. The provided information can be used as a guide in settlement decisions but cannot be used to definitively prove the existence or non-presence of an injury. In cases with a very low risk of whiplash or other injury, claims can be identified for further investigation. Conversely, for cases with a high risk of whiplash or other injury, the claim can be expedited, since early treatment is often effective in reducing the long term prognosis.

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010). Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Heli et al., 2002) and Sweden (Krafft et al., 2005). Injury risk studies consider the following risk factors: Crash configuration (front, side, rear, rollover), Delta-V = Change in velocity, Vehicle mass (size, weight), Vehicle stiffness, Vehicle geometry and engagement, Restraint system and its adjustment, Occupant seated position, Occupant profile (age, gender, previous injury), Number of WAD symptoms, and Psychological Distress. Structural damage and known whiplash thresholds overlap, indicating structural damage and repair cost are a poor predictor of minor injury threshold. Damage can also vary widely by vehicle model and impact configuration.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	1C6RR7MT2HS******
User	
Case Number	
EDR Data Imaging Date	06-08-2018
Crash Date	
Filename	1C6RR7MT2HS_ACM_2017RAM1500.CDRX
Saved on	Friday, June 8 2018 at 16:14:10
Imaged with CDR version	Crash Data Retrieval Tool 17.7
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 17.9
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	Most Recent Event 1st Prior Event

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

GENERAL INFORMATION:

CAUTION: During direct-to-module imaging where the Airbag Control Module (ACM) is disconnected and removed from a vehicle, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module (with appropriate adaptors in place, where required). Also, after a CDR imaging process, wait 2 minutes after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for direct-to-module imaging may cause new events to be recorded in the ACM.

- For additional definitions, please refer to the CDR Help File Glossary.
- As the VIN may be used to determine the configuration of the restraint system, it is imperative that the correct VIN be entered into the CDR Tool during the imaging process.
- For Fiat vehicles, the "Read VIN from Vehicle" feature in the CDR Tool will not work. The VIN will have to be manually entered.
- The 2019 MY RAM 1500 may take up to 30 minutes to retrieve the EDR data. The ignition will time out within 20 minutes so the vehicle flashers must be turned on within 20 minutes to keep the ignition and communication bus active.
- Lateral Delta V will not be displayed for the 2013 MY Jeep Compass and Patriot.
- Ignition Cycle, download/crash - For RAMs and Dodge Vipers, there are 2 internal ignition counters in the ACM. It is possible for the ignition cycles at download to be different than the ignition cycles at event due to the 2 different counters.
- The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. All directional references to sign notation are from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Angular Rate	Clockwise rotation around the longitudinal axis
Peripheral Sensors, X and Y	Outside to Inside
Pressure Sensors	Compression of air
Internal Y Acceleration	Left to Right
Low-g Z Acceleration	Downward
Steering Input	Steering wheel turned counter clockwise
Yaw Rate	Counter clockwise rotation

CDR FILE INFORMATION:

- An event will be stored when the delta V is approximately 5 mph (8 km/h) or greater within a 150 ms interval.
- For non-NAFTA ACMs that control pedestrian protection devices, a non-deployment event will be stored when the pedestrian protection devices are activated.
- A non-deployment event will be stored with activation of the Active Head Restraints.

Event(s) Recovered definitions:
- None - There are no stored events in the ACM
- Not Retrievable - Event Data may be stored in the ACM but is not retrievable by the CDR Tool.
- Most Recent Event - Data of the most recent event is displayed in the report
- 1st Prior Event - Two events are stored in the ACM, Data displayed is of the first prior event.
- 2nd Prior Event - Three events are stored in the ACM, Data displayed is of the second prior event.
- For 2013 and 2014 MY Dodge Journey and Fiat Freemont:
    - Event Record 1 - Data from an event is stored in the ACM (not necessarily in chronological order)
    - Event Record 2 - Data from another event is stored in the ACM (not necessarily in chronological order)
- For TRW modules:
    - If there is a side impact, two EDR events may be stored for the one side impact event. The second event may be recorded due to the Lateral Delta V exceeding 5 mph (8 km/h) within a 150 ms interval after the side deployment occurred.
- For some Fiat vehicles:
    - Two EDR events may be stored for one impact event. The second event may be recorded due to the deployment of the frontal airbag, 3rd stage passenger.
- During an event, if power to the ACM is lost, all or part of the event data record may not be recorded. An indication may be observed in the recorded data under this condition: The restraint data is recorded first and then the vehicle data.
    - "None" may be displayed in the "Event(s) Recovered" section of the report indicating no pre-crash vehicle data.
    - An event may be displayed in the "Event(s) Recovered" section of the report and "Interrupted" will be displayed for Pre-Crash Recorder Status.

SYSTEM STATUS AT RETRIEVAL:

- Original VIN - The VIN is captured by the ACM and then recorded as the Original VIN after 10 consecutive ignition cycles of capturing the same number. Once it has been recorded, this number cannot be changed.

SYSTEM CONFIGURATION AT RETRIEVAL/EVENT:

- The System Configuration data tables indicate the components that the ACM for a particular vehicle monitors and/or controls.
- Active Head Restraint (AHR) - This refers to some active head restraint systems that are electronically controlled by the ACM. AHRs may activate but not store an EDR Record if the delta V does not exceed the minimum delta V threshold. Activation of only the AHRs, if stored, will be a non-deployment event.

SYSTEM STATUS AT EVENT:

- Number, Total Events - Cumulative number of events that the ACM has recorded, including those non-deployment events that have been overwritten by a subsequent event.
- Occupant Size Classification, Outboard Front Passenger - "Child" status may be used to indicate anything weighing less than a 5th percentile female adult crash dummy, including an empty seat; "Not Child" indicates anything weighing the same as or more than a 5th percentile female adult crash dummy.
- Odometer at Event - Vehicle odometer at the time of the event
- Operation via Energy Reserve Only -"Yes" indicates that the ACM had lost power at or before T0 and was only operating on energy reserve at T0.
- System Voltage at Event, ACM - Voltage at the ACM as measured by the ACM.
- System Voltage at Event, Bussed - Voltage of the vehicle system, communicated on the communication bus to other electronic modules in the vehicle.
- Temperature, Outside - Ambient Air Temperature.
- Time, Airbag Warning Lamp On - This is a cumulative time. It indicates the total amount of time that the ACM has requested the Airbag Warning Lamp be turned on.
    - This time does not include the warning lamp bulb check time, which occurs at every ignition cycle
        - For 2013 MY Minivans and new 2017+ MY Jeep Compass, this time is only cumulative for the past 10 ignition cycles.
- Time from event 1 to 2 -
    - If only one event is stored, either a value of 0 or >5 may be displayed for this data element.
    - For the 2018+ MY Promaster and 2019+ MY RAM 1500, a value of 0 may be displayed for the first event or for events >5 seconds apart.
    - If multiple events exist in the EDR, the time from event 1 to event 2 is defined as:
        - For Bosch and TRW modules, the time from the prior recorded event (even if it has been overwritten) to the current recorded event.
        - For Continental modules, the time from the prior existing recorded event (as long as it is still displayed in the CDR report) to the current recorded event. If the prior event in a multi-event condition is overwritten by a subsequent event, the multi-event status will no longer be displayed.
        - For the 2019+ MY RAM 1500, the time from event 1 to 2 may utilize a non-stored event as event 1. In this case, the total

number of events and multi-event data elements will not include the non-stored event in the number of events. However, the time from event 1 to 2 will be shown as time from that non-stored event.

- Time, Operation System Time - This is a cumulative lifetime timer for the ACM. It indicates the total amount of time the ACM has been powered up.
- VIN at Event, Last 8 Digits- Last 8 digits of the VIN of the vehicle at the time the ACM records the event.

DEPLOYMENT COMMAND DATA:

- A "Yes" for a particular item indicates that the ACM commanded the deployment /activation of the associated device.
- The phrase "Exceeded Storage Range" for a particular time to deploy indicates that the deployment time is equal to or greater than the 255 milliseconds that can be stored.
- If a device is not deployed, the "time to deploy" for that device will display 0, SNA, N/A or 255.

DTCs PRESENT AT START OF EVENT:

- If any DTCs (diagnostic trouble codes) are present in the ACM at the start of the event, these will be listed in this section. A dealership service manual can be used to decode the DTCs.
    - DTCs Present at Start of Event are not present in the Alfa Romeo Giulia, Fiat 500X, and the Jeep Renegade.

SENSOR DATA:

- The design range for the angular rate data is:
    - +/- 240 deg/sec for Bosch ACMs
    - +/- 300 deg/sec for TRW ACMs, the 2019 MY RAM 1500, and the 2018+ MY Dodge Journey
    - +/- 290 deg/sec for 2008+ MY minivans and 2009-2017 MY Dodge Journey
    - +/- 340 deg/sec for 2017+ MY Chrysler Pacifica and new 2017+ MY Jeep Compass
- For vehicles that store peripheral sensor data, t0 for the peripheral sensors is the same as the t0 for the delta V.
- Internal y acceleration is stored prior to t0 so the internal y acceleration data will usually be zero unless the rollover sensing algorithm has triggered storage of the EDR event.
- The words "Sensor Design Range Exceeded" and a vertical line will be displayed on the Longitudinal and Lateral Delta-V graphs the first time the applicable sensor range is exceeded.

PRE-CRASH DATA:

- The recorded Event may contain Pre-Crash data. Pre-Crash data from the various electronic control modules in the vehicle is transmitted to the Airbag Control Module via the vehicle's communication bus.
- (if equip.) - If a parameter name is followed by the words (if equip.), then the parameter is only valid for vehicles equipped with the associated parameter/vehicle system.
- The MIL (Malfunction Indicator Lamp) Status for the various recorded systems indicates the requested state of the applicable malfunction indicator lamp at the time that the data was captured. Note: Some fault codes could be stored due to component/system damage from the accident. The appropriate diagnostic tool should be used to read any stored Diagnostic Trouble Codes (DTC's) in the various electronic modules (ACM, PCM, ABS, TCM, etc., where applicable) for use in interpretation of some vehicle specific recorded data.
- ABS Activity - "Yes" indicates an active ABS event in which the ABS is actively controlling the brakes.
- ABS MIL- This indicates the ABS fault indicator lamp status. It will only be "On" when there is a fault in the ABS system. The Electronic brake module DTC's should be read and recorded for final system interpretation.
- Accelerator Pedal, % Full - This indicates the actual position of the accelerator pedal. It will be "SNA" if the vehicle is in the power free mode which limits acceleration.
- Accelerator Pedal (Derived), % Full - This indicates the calculated value of the accelerator pedal for battery electric vehicles only.
- Accelerator Pedal/Engine Throttle, % Full - This indicates the actual position of the accelerator pedal unless the cruise control is engaged. If the cruise control is engaged, this indicates the actual position of the engine throttle blade.
- Braking System, Maximum Braking - "Yes" indicates that ABS is active on all 4 wheels.
- Cruise Control:
    - Cruise Control System/Lamp Status -"On" indicates that the Cruise Control system is turned on.
    - Cruise Control Engaged Status/Active - "Engaged"/"Yes" indicates the Cruise Control system is actively controlling vehicle speed. "Not Engaged"/"No" indicates the system is NOT controlling vehicle speed.
    - Adaptive Cruise Control (ACC) Status (if equip.)- "Off" indicates that all cruise control functionality is disabled; "NCC_On" indicates that the Normal Cruise Control system is turned on; "NCC_Set" indicates the Normal Cruise Control is actively controlling vehicle speed; "ACC_On" indicates that ACC is turned on; "ACC_Set" indicates that the ACC is actively controlling vehicle speed. If the value is SNA for all time stamps, then the vehicle is not equipped with ACC.
    - ACC Speed Set (if equip.)- This indicates the desired speed in mph that was input by the driver for the ACC system. If the value is SNA for all time stamps, then the vehicle is not equipped with ACC.
- Drive Mode - This indicates the driver selected mode of operation (e.g. normal, sport, track, ...)
- Electronic Brake/Stability Control information:
    - Stability Control - This is the status of the ESC symbol - "car with squiggly lines" indicator lamp. "On" indicates that the ESC system is functional. "Off" indicates that the ESC system was turned off either by the driver or due to a fault or thermal mode shutdown. "Engaged" indicates an active ESC/TCS event. "Partial Off" indicates that engine management has been turned off but traction control is still functional.
        - For the Jeep Renegade, if the Stability Control is "Off", the ESC Button Status is "Disabled", and the vehicle speed exceeds 40 mph, the stability control system will operate in a reduced functionality mode with traction control turned off ("partial off" mode)

even though the user disabled it. For all other conditions, when the Stability Control is "Off", the stability control system will be off
- ESC Button Status - This indicates the driver selected mode for the ESC system. "Disabled" indicates that the driver pressed the ESC Button for 5 seconds to disable the ESC System. "Enabled" indicates that the ESC button has not been pressed for 5 seconds and thus the ESC System is enabled.
- ESC/ESP MIL - This indicates the ESC/ESP fault indication lamp status. It will only be "On" when there is a fault or thermal mode shutdown in the ESC/ESP system. The ESC/ESP module DTC's should be read and recorded for final system interpretation
- Brake Intervention by ESP - "Yes" indicates that the stability control system has engaged the brakes.
- Engine Torque Applied - "No" indicates no engine torque output was applied (as in Park/Neutral for Automatic transmissions or clutch depressed on manual or during an ESP/Traction Control event). If "Yes", then engine torque output was applied.
- Traction Control Active - "Yes" indicates that the traction control system is actively controlling the vehicle's wheels.

- Electronic Park Brake (EPB):
  - Park Brake Engaged - "Yes" indicates that the park brake is applied.
  - EPB MIL - "On" indicates that there is a fault in the Electronic Park Brake System.
- Engine Throttle. % Full - This indicates the actual position of the Engine Throttle blade. This data element is not supported by vehicles with diesel engines. Thus a value of "SNA" will be displayed if the vehicle has a diesel engine
- ETC Lamp - Lamp "ON "indicates there is an active Electronic Throttle DTC
- ETC Lamp Flashing - "Yes" indicates that the ETC is in the limp-in mode.
- Forward Collision Warning (FCW) (if equip.):
  - Object of Interest Distance - This indicates the actual forward distance to the main object being tracked by the FCW system. "FCW present but not tracking" indicates that the FCW system is not currently tracking an object. If the value is SNA for all time stamps then the vehicle is not equipped with FCW.
  - FCW System Status - "Off" indicates that the FCW system is off and the FCW Warning Lamp will be "On". "On-braking" indicates that the FCW system is on with active braking enabled but there will no FCW audible or visual warnings in an FCW event. "On-warning" indicates that the FCW system is on but active braking is disabled. In an FCW event, the driver will only receive FCW audible and visual warnings. "On-full" indicates that the FCW system is fully on with active braking as well as the audible and visual warnings enabled. SNA indicates that the vehicle is not equipped with FCW
- Gear Position - This indicates the current transmission gear.
- Master Cylinder Pressure - This indicates the brake pressure applied to the brakes by the driver.
- PCM MIL - This indicates the PCM fault indicator lamp status. It will only be "On" when there is a fault in the PCM. The Powertrain Control Module DTC's should be read and recorded for final system interpretation
- Pre-Crash Recorder Complete - Due to the interruption of data recording in one section, this data element may display "Interrupted" for all sections when some data sections are actually complete
  - For the 2014 MY Jeep Grand Cherokee and Dodge Durango, if recording of angular rate data is interrupted, the entire EDR record will display "Interrupted" even though the rest of the data may be complete
- PRND/PRNDL/PRNDS Status - This indicates the status of the Shifter Position.
- Raw Manifold Pressure - This indicates engine load in kPa.
- Reverse Gear - For manual transmission vehicles only, "Yes" indicates the transmission is in the reverse gear.
- Service Brake - "On" indicates that the brake pedal is depressed.
- Speed, Vehicle Indicated - This indicates the average of the drive wheels. The accuracy of the recorded Speed, Vehicle Indicated will be affected if the vehicle had the tire size or the final drive axle ratio changed from the factory build specifications. On some vehicles capable of speeds in excess of 255km/h (about 158mph), the actual vehicle speed may have exceeded the reporting range. It is always prudent to check the reported wheel speeds and other parameters to confirm the Speed, Vehicle Indicated value(s).
- Tire Information:
  - XX where LF = Left Front Tire, RF = Right Front Tire, LR = Left Rear Tire, and RR = Right Rear Tire.
  - Tire X Location - This indicates the location of the tire pressure sensor data being displayed for that time stamp. Default is used to indicate that the location of the tire pressure sensor is unknown or there is no tire pressure sensor in that wheel. Vehicles with Base Tire Pressure Monitoring systems will display SNA for both Tire Locations as these vehicles do not send actual pressure values across the communication bus.
  - Tire X Pressure/Tire Pressure Status, XX -This indicates the actual pressure status of the Tire Location defined in the previous column (Tire X Location) or by the values for XX. Possible values are LOW, NORMAL, HIGH, or SNA for this parameter. Vehicles with Base Tire Pressure Monitoring systems may display NORMAL even though these vehicles do not send actual pressure values across the communication bus.
  - Tire X Pressure/Tire Pressure Value, XX (psi) - This indicates the actual tire pressure value of the Tire Location defined in the previous column (Tire X Location) or by the values for XX. Vehicles with Base Tire Pressure Monitoring systems will display N/A for this parameter as these vehicles do not send actual pressure values across the communication bus
    - For the following vehicles, the tire location, if displayed, may not be accurate if the tires have been rotated:
      - 2013 MY Ram
      - 2013-2017 MY Jeep Patriot
      - 2013-2014 MY Chrysler 200
      - 2013-2017 MY Jeep Compass
      - 2013-2016 MY Dodge Dart
      - For the 2013 MY Ram, if the values for tire pressure status and the tire pressure are SNA, the EDR does not store tire pressure monitoring data.
    - Tire pressure is not stored in the EDR for the following vehicles:
      - 2014-2018 MY RAM 1500
      - 2014+ MY RAM (all but 1500)
      - 2013+ MY Jeep Wrangler
      - 2013 MY Jeep Grand Cherokee
      - 2013 MY Dodge Durango
      - 2013-2014 MY Dodge Challenger
      - 2013-2016 MY Chrysler Town and Country

    - 2013+ MY Dodge Grand Caravan
    - 2015+ MY Fiat 500
  - Wheel Speed, XX - This indicates the speed value (in revolutions per minute) of a particular tire as denoted by XX.
- Tire Pressure Monitor Indicator Lamp/Faults - "On" indicates a fault in the tire pressure monitoring system. The TPM module DTC's should be read and recorded for final system interpretation.
- "T0" ("Time zero" where '0' is seen as subscript) is defined as "beginning of the crash event". T0 is the time at which the ACM algorithm is activated, a specific Delta-V is exceeded, or a non-reversible restraint device is deployed. T0 may be defined differently for front, side, rear and roll-over events.
  - If multiple algorithm decisions (i.e.: frontal, side, rear and/or rollover) are made before the first recorded event ends, all of those events are part of the same event record and "T0" is defined as the "T0" from the first recorded event.
  - In the Pre-Crash data tables, the relative time marker "-0.1s" or "-0.25s" respectively represents the last set of data captured in the buffer prior to "T0."
- Torque Information:
  - Axle Torque - This indicates the E-Motor Torque multiplied by the gear ratio for battery electric vehicles only.
  - E-Motor Torque - This indicates the calculated torque from the output shaft of the electric motor in battery electric vehicles only.
- Traction Control Intervention Active - "Active" indicates wheel slippage was occurring during vehicle acceleration.

APPLICATION INFORMATION:

- Jeep Renegade and Alfa Romeo Giulia are only CDR supported in the NAFTA market.

03002_Chrysler_ r036

System Status at Retrieval

Original VIN	1C6RR7MT2HS******
Ignition Cycle, Download	1584
ACM Part Number	68303218AA
ECU Serial Number	T52MD005701327
ACM Supplier	Bosch
ECU Supply Voltage at Time of Retrieval	12.2

System Configuration at Retrieval

Configured for Driver Frontal Airbag	Yes
Configured for Passenger Airbag	Yes
Configured for Driver Retractor Pretensioner	Yes
Configured for Passenger Retractor Pretensioner	Yes
Configured for Left Side Curtain Airbag	Yes
Configured for Right Side Curtain Airbag	Yes
Configured for Front Left Seat Airbags	Yes
Configured for Front Right Seat Airbag	Yes
Configured for Safety Belt Status, Driver	Yes
Configured for Safety Belt Status, Outboard Front Passenger	Yes
Configured for Seat Track Position Switch, Foremost, Status, Driver	No
Configured for Seat Track Position Switch, Foremost, Status, Outboard Front Passenger	No

System Configuration at Event (Most Recent Event)

Configured for Driver Frontal Airbag	Yes
Configured for Passenger Airbag	Yes
Configured for Driver Retractor Pretensioner	Yes
Configured for Passenger Retractor Pretensioner	Yes
Configured for Left Side Curtain Airbag	Yes
Configured for Right Side Curtain Airbag	Yes
Configured for Front Left Seat Airbags	Yes
Configured for Front Right Seat Airbag	Yes
Configured for Safety Belt Status, Driver	Yes
Configured for Safety Belt Status, Outboard Front Passenger	Yes
Configured for Seat Track Position Switch, Foremost, Status, Driver	No
Configured for Seat Track Position Switch, Foremost, Status, Outboard Front Passenger	No

System Status at Event (Most Recent Event)

Event Number	2
Multi-Event, Number of Events (1,2)	1
Total number of events	2
Time from Event 1 to 2 (Time since last event)(sec)	>5
Complete File Recorded (Yes, No)	Yes
Maximum Delta-V Longitudinal (MPH [km/h])	-8.7 [-14]
Time, Maximum Delta-V, Longitudinal (msec)	122
Maximum Delta-V Lateral (MPH [km/h])	-5.0 [-8]
Time, Maximum Delta-V, Lateral (msec)	94
Ignition Cycle, Crash	1576
Safety Belt Status, Driver	Buckled
Safety Belt Status, Outboard Front Passenger	Not Buckled
Airbag Warning Lamp, On/Off	On
Operation System Time (sec)	1608307
Airbag Warning Lamp On Time Before Event (min)	0
Supply Voltage at Event, ACM (V)	13.1
Operation via Energy Reserve	No
VIN at Event (last 8 digits)	HS******
Odometer at Event (km [miles])	20844 [12951.9]

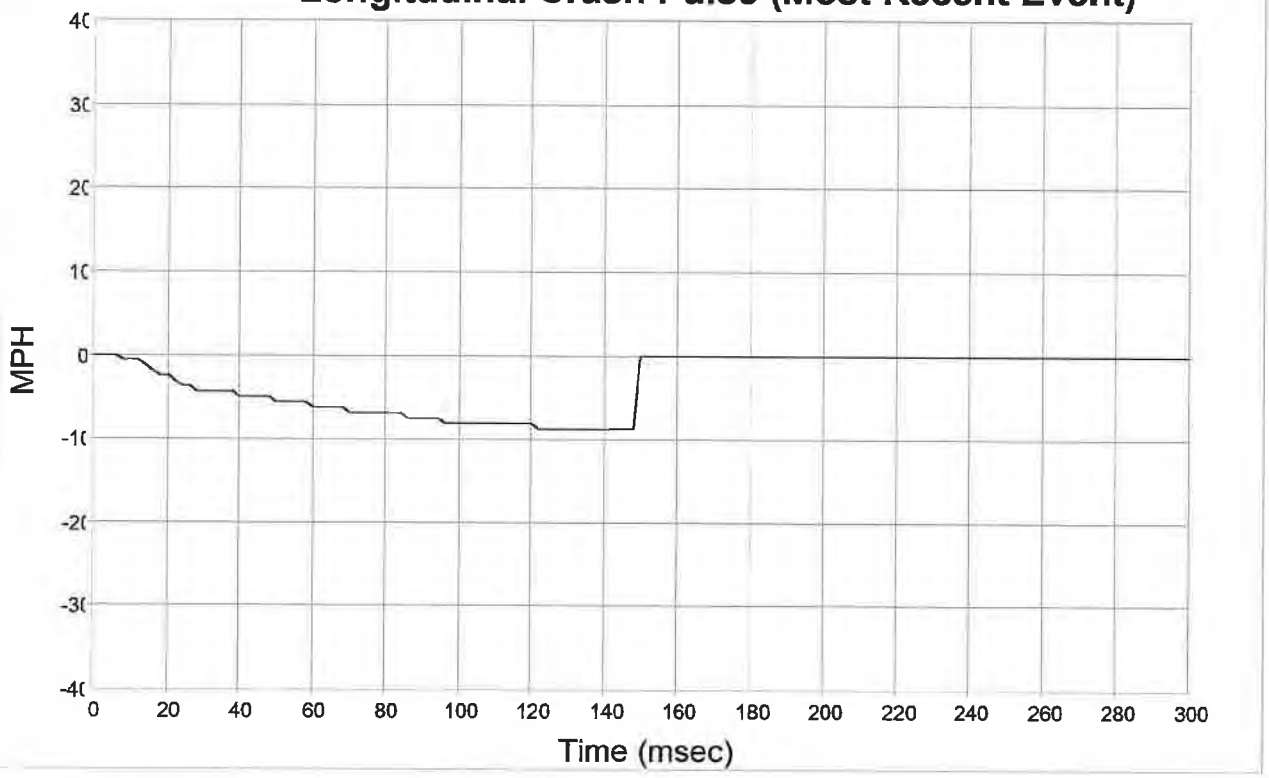
Deployment Command Data (Most Recent Event)

Driver Frontal Airbag Commanded	No
Driver Front Airbag, Time to 1st stage (msec)	0
Driver Front Airbag, Time to 2nd Stage from T0 (msec)	0
Passenger Frontal Airbag Commanded	No
Passenger Front Airbag, Time to 1st stage (msec)	0
Passenger Front Airbag, Time to 2nd Stage from T0 (msec)	0
Commanded Driver Retractor Pretensioner Deployment	No
Commanded Passenger Retractor Pretensioner Deployment	No
Commanded Left Side Curtain Airbag Deployment	No
Commanded Left Seat Airbag Deployment	No
Commanded Right Side Curtain Airbag Deployment	No
Commanded Front Right Side Seat Airbag Deployment	No

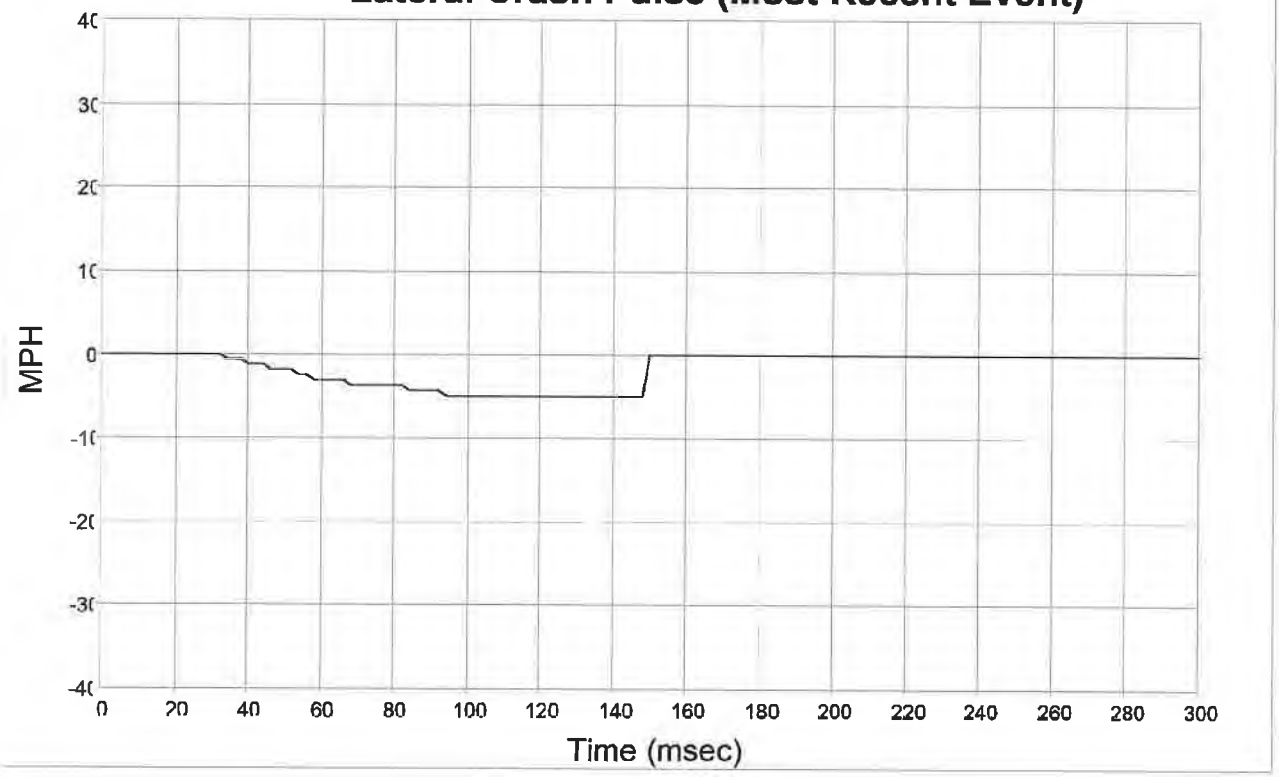
DTCs Present at Start of Event (Most Recent Event)

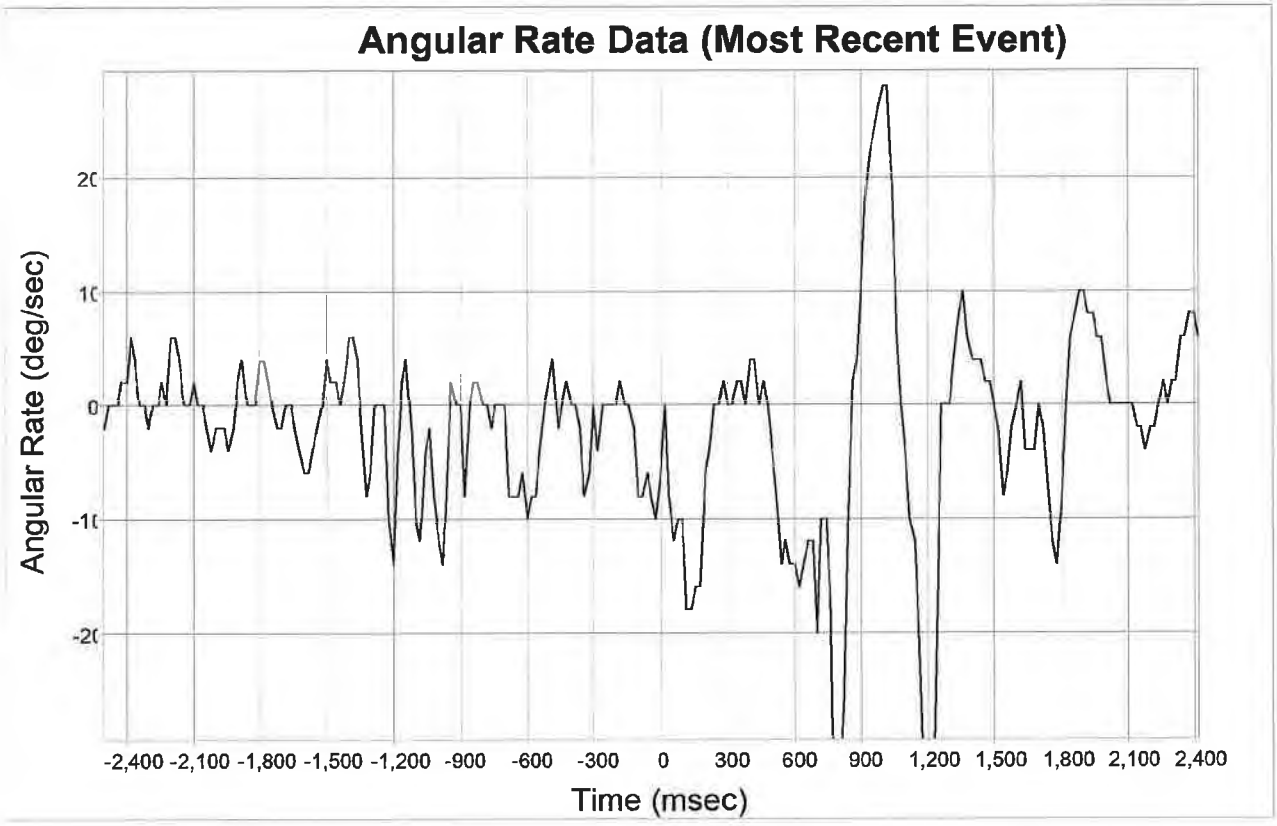
DTC Number	DTC Status
C10CC-00	Active
B0020-11	Active
B0021-13	Active
B007F-13	Active
B007E-13	Active

Longitudinal Crash Pulse (Most Recent Event)



Lateral Crash Pulse (Most Recent Event)




Angular Rate Data (Most Recent Event)
Angular Rate (deg/sec)
20
10
0
-10
-20
-2,400 -2,100 -1,800 -1,500 -1,200 -900 -600 -300 0 300 600 900 1,200 1,500 1,800 2,100 2,400
Time (msec)

Longitudinal Crash Pulse (Most Recent Event)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
0	0.0 [0]
2	0.0 [0]
4	0.0 [0]
6	0.0 [0]
8	-0.6 [-1]
10	-0.6 [-1]
12	-0.6 [-1]
14	-1.2 [-2]
16	-1.9 [-3]
18	-2.5 [-4]
20	-2.5 [-4]
22	-3.1 [-5]
24	-3.7 [-6]
26	-3.7 [-6]
28	-4.3 [-7]
30	-4.3 [-7]
32	-4.3 [-7]
34	-4.3 [-7]
36	-4.3 [-7]
38	-4.3 [-7]
40	-5.0 [-8]
42	-5.0 [-8]
44	-5.0 [-8]
46	-5.0 [-8]
48	-5.0 [-8]
50	-5.6 [-9]
52	-5.6 [-9]
54	-5.6 [-9]
56	-5.6 [-9]
58	-5.6 [-9]
60	-6.2 [-10]
62	-6.2 [-10]
64	-6.2 [-10]
66	-6.2 [-10]
68	-6.2 [-10]
70	-6.8 [-11]
72	-6.8 [-11]
74	-6.8 [-11]
76	-6.8 [-11]
78	-6.8 [-11]
80	-6.8 [-11]
82	-6.8 [-11]
84	-6.8 [-11]
86	-7.5 [-12]
88	-7.5 [-12]
90	-7.5 [-12]
92	-7.5 [-12]
94	-7.5 [-12]
96	-8.1 [-13]
98	-8.1 [-13]

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
100	-8.1 [-13]
102	-8.1 [-13]
104	-8.1 [-13]
106	-8.1 [-13]
108	-8.1 [-13]
110	-8.1 [-13]
112	-8.1 [-13]
114	-8.1 [-13]
116	-8.1 [-13]
118	-8.1 [-13]
120	-8.1 [-13]
122	-8.7 [-14]
124	-8.7 [-14]
126	-8.7 [-14]
128	-8.7 [-14]
130	-8.7 [-14]
132	-8.7 [-14]
134	-8.7 [-14]
136	-8.7 [-14]
138	-8.7 [-14]
140	-8.7 [-14]
142	-8.7 [-14]
144	-8.7 [-14]
146	-8.7 [-14]
148	-8.7 [-14]
150	0.0 [0]
152	0.0 [0]
154	0.0 [0]
156	0.0 [0]
158	0.0 [0]
160	0.0 [0]
162	0.0 [0]
164	0.0 [0]
166	0.0 [0]
168	0.0 [0]
170	0.0 [0]
172	0.0 [0]
174	0.0 [0]
176	0.0 [0]
178	0.0 [0]
180	0.0 [0]
182	0.0 [0]
184	0.0 [0]
186	0.0 [0]
188	0.0 [0]
190	0.0 [0]
192	0.0 [0]
194	0.0 [0]
196	0.0 [0]
198	0.0 [0]

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
200	0.0 [0]
202	0.0 [0]
204	0.0 [0]
206	0.0 [0]
208	0.0 [0]
210	0.0 [0]
212	0.0 [0]
214	0.0 [0]
216	0.0 [0]
218	0.0 [0]
220	0.0 [0]
222	0.0 [0]
224	0.0 [0]
226	0.0 [0]
228	0.0 [0]
230	0.0 [0]
232	0.0 [0]
234	0.0 [0]
236	0.0 [0]
238	0.0 [0]
240	0.0 [0]
242	0.0 [0]
244	0.0 [0]
246	0.0 [0]
248	0.0 [0]
250	0.0 [0]
252	0.0 [0]
254	0.0 [0]
256	0.0 [0]
258	0.0 [0]
260	0.0 [0]
262	0.0 [0]
264	0.0 [0]
266	0.0 [0]
268	0.0 [0]
270	0.0 [0]
272	0.0 [0]
274	0.0 [0]
276	0.0 [0]
278	0.0 [0]
280	0.0 [0]
282	0.0 [0]
284	0.0 [0]
286	0.0 [0]
288	0.0 [0]
290	0.0 [0]
292	0.0 [0]
294	0.0 [0]
296	0.0 [0]
298	0.0 [0]
300	0.0 [0]

Lateral Crash Pulse (Most Recent Event)

Time (msec)	Delta-V, Lateral (MPH [km/h])
0	0.0 [0]
2	0.0 [0]
4	0.0 [0]
6	0.0 [0]
8	0.0 [0]
10	0.0 [0]
12	0.0 [0]
14	0.0 [0]
16	0.0 [0]
18	0.0 [0]
20	0.0 [0]
22	0.0 [0]
24	0.0 [0]
26	0.0 [0]
28	0.0 [0]
30	0.0 [0]
32	0.0 [0]
34	-0.6 [-1]
36	-0.6 [-1]
38	-0.6 [-1]
40	-1.2 [-2]
42	-1.2 [-2]
44	-1.2 [-2]
46	-1.9 [-3]
48	-1.9 [-3]
50	-1.9 [-3]
52	-1.9 [-3]
54	-2.5 [-4]
56	-2.5 [-4]
58	-3.1 [-5]
60	-3.1 [-5]
62	-3.1 [-5]
64	-3.1 [-5]
66	-3.1 [-5]
68	-3.7 [-6]
70	-3.7 [-6]
72	-3.7 [-6]
74	-3.7 [-6]
76	-3.7 [-6]
78	-3.7 [-6]
80	-3.7 [-6]
82	-3.7 [-6]
84	-4.3 [-7]
86	-4.3 [-7]
88	-4.3 [-7]
90	-4.3 [-7]
92	-4.3 [-7]
94	-5.0 [-8]
96	-5.0 [-8]
98	-5.0 [-8]
100	-5.0 [-8]
102	-5.0 [-8]
104	-5.0 [-8]
106	-5.0 [-8]
108	-5.0 [-8]
110	-5.0 [-8]
112	-5.0 [-8]
114	-5.0 [-8]
116	-5.0 [-8]
118	-5.0 [-8]
120	-5.0 [-8]
122	-5.0 [-8]
124	-5.0 [-8]
126	-5.0 [-8]
128	-5.0 [-8]
130	-5.0 [-8]
132	-5.0 [-8]
134	-5.0 [-8]
136	-5.0 [-8]
138	-5.0 [-8]
140	-5.0 [-8]
142	-5.0 [-8]
144	-5.0 [-8]
146	-5.0 [-8]
148	-5.0 [-8]
150	0.0 [0]
152	0.0 [0]
154	0.0 [0]
156	0.0 [0]
158	0.0 [0]
160	0.0 [0]
162	0.0 [0]
164	0.0 [0]
166	0.0 [0]
168	0.0 [0]
170	0.0 [0]
172	0.0 [0]
174	0.0 [0]
176	0.0 [0]
178	0.0 [0]
180	0.0 [0]
182	0.0 [0]
184	0.0 [0]
186	0.0 [0]
188	0.0 [0]
190	0.0 [0]
192	0.0 [0]
194	0.0 [0]
196	0.0 [0]
198	0.0 [0]
200	0.0 [0]
202	0.0 [0]
204	0.0 [0]
206	0.0 [0]
208	0.0 [0]
210	0.0 [0]
212	0.0 [0]
214	0.0 [0]
216	0.0 [0]
218	0.0 [0]
220	0.0 [0]
222	0.0 [0]
224	0.0 [0]
226	0.0 [0]
228	0.0 [0]
230	0.0 [0]
232	0.0 [0]
234	0.0 [0]
236	0.0 [0]
238	0.0 [0]
240	0.0 [0]
242	0.0 [0]
244	0.0 [0]
246	0.0 [0]
248	0.0 [0]
250	0.0 [0]
252	0.0 [0]
254	0.0 [0]
256	0.0 [0]
258	0.0 [0]
260	0.0 [0]
262	0.0 [0]
264	0.0 [0]
266	0.0 [0]
268	0.0 [0]
270	0.0 [0]
272	0.0 [0]
274	0.0 [0]
276	0.0 [0]
278	0.0 [0]
280	0.0 [0]
282	0.0 [0]
284	0.0 [0]
286	0.0 [0]
288	0.0 [0]
290	0.0 [0]
292	0.0 [0]
294	0.0 [0]
296	0.0 [0]
298	0.0 [0]
300	0.0 [0]

Angular Rate Data (Most Recent Event)

Time (msec)	Angular Rate (deg/sec)
-2500	-2.00
-2480	0.00
-2460	0.00
-2440	0.00
-2420	2.00
-2400	2.00
-2380	6.00
-2360	4.00
-2340	0.00
-2320	0.00
-2300	-2.00
-2280	0.00
-2260	0.00
-2240	2.00
-2220	0.00
-2200	6.00
-2180	6.00
-2160	4.00
-2140	0.00
-2120	0.00
-2100	2.00
-2080	0.00
-2060	0.00
-2040	-2.00
-2020	-4.00
-2000	-2.00
-1980	-2.00
-1960	-2.00
-1940	-4.00
-1920	-2.00
-1900	2.00
-1880	4.00
-1860	0.00
-1840	0.00
-1820	0.00
-1800	4.00
-1780	4.00
-1760	2.00
-1740	0.00
-1720	-2.00
-1700	-2.00
-1680	0.00
-1660	0.00
-1640	-2.00
-1620	-4.00
-1600	-6.00
-1580	-6.00
-1560	-4.00
-1540	-2.00
-1520	0.00

Time (msec)	Angular Rate (deg/sec)
-1500	4.00
-1480	2.00
-1460	2.00
-1440	0.00
-1420	2.00
-1400	6.00
-1380	6.00
-1360	4.00
-1340	-2.00
-1320	-8.00
-1300	-6.00
-1280	0.00
-1260	0.00
-1240	0.00
-1220	-10.00
-1200	-14.00
-1180	-4.00
-1160	2.00
-1140	4.00
-1120	-2.00
-1100	-10.00
-1080	-12.00
-1060	-4.00
-1040	-2.00
-1020	-8.00
-1000	-12.00
-980	-14.00
-960	-6.00
-940	2.00
-920	0.00
-900	0.00
-880	-8.00
-860	0.00
-840	2.00
-820	2.00
-800	0.00
-780	0.00
-760	-2.00
-740	0.00
-720	0.00
-700	0.00
-680	-8.00
-660	-8.00
-640	-8.00
-620	-6.00
-600	-10.00
-580	-8.00
-560	-8.00
-540	-4.00
-520	0.00

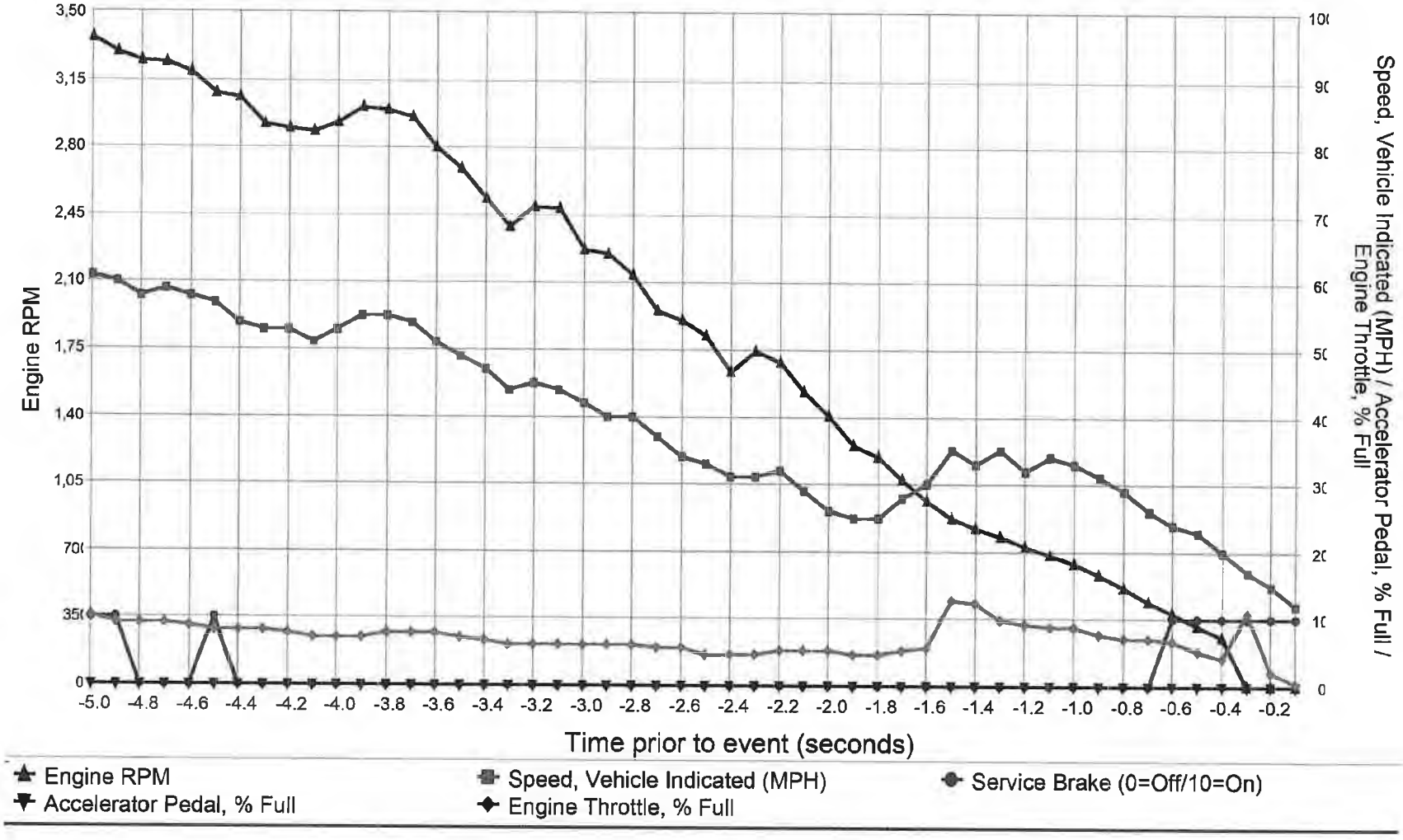
Time (msec)	Angular Rate (deg/sec)
-500	2.00
-480	4.00
-460	-2.00
-440	0.00
-420	2.00
-400	0.00
-380	0.00
-360	-2.00
-340	-8.00
-320	-6.00
-300	0.00
-280	-4.00
-260	0.00
-240	0.00
-220	0.00
-200	0.00
-180	2.00
-160	0.00
-140	0.00
-120	-2.00
-100	-8.00
-80	-8.00
-60	-6.00
-40	-8.00
-20	-10.00
0	-6.00
20	0.00
40	-8.00
60	-12.00
80	-10.00
100	-10.00
120	-18.00
140	-18.00
160	-16.00
180	-16.00
200	-6.00
220	-4.00
240	0.00
260	0.00
280	2.00
300	0.00
320	0.00
340	2.00
360	2.00
380	0.00
400	4.00
420	4.00
440	0.00
460	2.00
480	0.00

Angular Rate Data (Most Recent Event)

Time (msec)	Angular Rate (deg/sec)
500	-4.00
520	-8.00
540	-14.00
560	-12.00
580	-14.00
600	-14.00
620	-16.00
640	-14.00
660	-12.00
680	-12.00
700	-20.00
720	-10.00
740	-10.00
760	-18.00
780	-36.00
800	-38.00
820	-26.00
840	-10.00
860	2.00
880	4.00
900	10.00
920	18.00
940	22.00
960	24.00
980	26.00
1000	28.00
1020	28.00
1040	20.00
1060	6.00
1080	0.00
1100	-4.00
1120	-10.00
1140	-12.00
1160	-20.00
1180	-30.00
1200	-34.00
1220	-50.00
1240	-22.00
1260	0.00
1280	0.00
1300	0.00
1320	4.00
1340	8.00
1360	10.00
1380	6.00
1400	4.00
1420	4.00
1440	4.00
1460	2.00
1480	2.00

Time (msec)	Angular Rate (deg/sec)
1500	0.00
1520	-2.00
1540	-8.00
1560	-6.00
1580	-2.00
1600	0.00
1620	2.00
1640	-4.00
1660	-4.00
1680	-4.00
1700	0.00
1720	-2.00
1740	-8.00
1760	-12.00
1780	-14.00
1800	-8.00
1820	0.00
1840	6.00
1860	8.00
1880	10.00
1900	10.00
1920	8.00
1940	8.00
1960	6.00
1980	6.00
2000	2.00
2020	0.00
2040	0.00
2060	0.00
2080	0.00
2100	0.00
2120	0.00
2140	-2.00
2160	-2.00
2180	-4.00
2200	-2.00
2220	-2.00
2240	0.00
2260	2.00
2280	0.00
2300	2.00
2320	2.00
2340	6.00
2360	6.00
2380	8.00
2400	8.00
2420	6.00

Pre-Crash Data (Most Recent Event)



SNA values will not be plotted on the graph

Pre-Crash Data (Most Recent Event - table 1 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Pre-Crash Recorder Status	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full	Engine Throttle, % Full	Service Brake	Engine RPM	ABS Activity	Stability Control	Steering Input (deg)
-5.0	Complete	61 [98]	0	10	On	3,366	Yes	Off	-221
-4.9	Complete	60 [97]	0	9	On	3,291	Yes	Off	-194
-4.8	Complete	58 [94]	0	9	Off	3,253	No	Off	-186
-4.7	Complete	59 [95]	0	9	Off	3,246	No	Off	-160
-4.6	Complete	58 [94]	0	9	Off	3,191	No	Off	-134
-4.5	Complete	57 [91]	0	8	On	3,081	Yes	Off	-99
-4.4	Complete	54 [87]	0	8	Off	3,059	No	Off	-71
-4.3	Complete	53 [86]	0	8	Off	2,916	No	Off	-65
-4.2	Complete	53 [85]	0	8	Off	2,894	No	Off	-45
-4.1	Complete	51 [82]	0	7	Off	2,885	No	Off	-6
-4.0	Complete	53 [86]	0	7	Off	2,929	No	Off	11
-3.9	Complete	55 [88]	0	7	Off	3,011	No	Off	20
-3.8	Complete	55 [88]	0	8	Off	2,993	No	Off	27
-3.7	Complete	54 [86]	0	8	Off	2,959	No	Off	28
-3.6	Complete	51 [82]	0	8	Off	2,803	No	Off	30
-3.5	Complete	49 [78]	0	7	Off	2,690	No	Off	39
-3.4	Complete	47 [76]	0	7	Off	2,537	No	Off	48
-3.3	Complete	44 [71]	0	6	Off	2,390	No	Off	49
-3.2	Complete	45 [72]	0	6	Off	2,490	No	Off	50
-3.1	Complete	44 [71]	0	6	Off	2,483	No	Off	50
-3.0	Complete	42 [68]	0	6	Off	2,274	No	Off	50
-2.9	Complete	40 [65]	0	6	Off	2,250	No	Off	46
-2.8	Complete	40 [64]	0	6	Off	2,140	No	Off	29
-2.7	Complete	37 [59]	0	6	Off	1,955	No	Off	-5
-2.6	Complete	34 [55]	0	6	Off	1,904	No	Off	-28
-2.5	Complete	33 [53]	0	5	Off	1,821	No	Off	-32
-2.4	Complete	31 [49]	0	5	Off	1,635	No	Off	-35
-2.3	Complete	31 [49]	0	5	Off	1,741	No	Off	-48
-2.2	Complete	32 [51]	0	5	Off	1,686	No	Off	-56
-2.1	Complete	29 [46]	0	5	Off	1,533	No	Off	-54
-2.0	Complete	26 [42]	0	5	Off	1,405	No	Off	-51
-1.9	Complete	25 [39]	0	5	Off	1,250	No	Off	-51
-1.8	Complete	25 [40]	0	5	Off	1,193	No	Off	-51
-1.7	Complete	28 [45]	0	5	Off	1,077	No	Off	-53
-1.6	Complete	30 [48]	0	6	Off	960	No	Off	-63
-1.5	Complete	35 [57]	0	13	Off	878	No	Off	-86
-1.4	Complete	33 [54]	0	12	Off	820	No	Off	-109
-1.3	Complete	35 [57]	0	10	Off	777	No	Off	-133
-1.2	Complete	32 [52]	0	9	Off	726	No	Off	-158
-1.1	Complete	34 [55]	0	9	Off	684	No	Off	-179
-1.0	Complete	33 [53]	0	9	Off	637	No	Off	-193
-0.9	Complete	31 [51]	0	8	Off	579	No	Off	-205
-0.8	Complete	29 [47]	0	7	Off	512	No	Off	-222
-0.7	Complete	26 [42]	0	7	Off	441	No	Off	-225
-0.6	Complete	24 [38]	0	7	On	383	Yes	Off	-212
-0.5	Complete	23 [36]	0	5	On	313	Yes	Off	-209
-0.4	Complete	20 [33]	0	4	On	258	Yes	Off	-210
-0.3	Complete	17 [28]	0	11	On	0	Yes	Off	-213
-0.2	Complete	15 [24]	0	2	On	0	Yes	Off	-226
-0.1	Complete	12 [19]	0	1	On	0	Yes	Off	-233

Pre-Crash Data (Most Recent Event - table 2 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Raw Manifold Pressure (kPa)	PCM MIL	Yaw Rate (deg/sec)	Wheel Speed LF (RPM)	Wheel Speed RF (RPM)	Wheel Speed LR (RPM)	Wheel Speed RR (RPM)	ETC Lamp
-5.0	15.20	Off	SNA	39	433	659	603	Off
-4.9	15.20	Off	SNA	11	581	643	609	Off
-4.8	15.20	Off	SNA	0	610	617	599	Off
-4.7	15.20	Off	SNA	0	636	585	675	Off
-4.6	14.40	Off	SNA	0	632	545	644	Off
-4.5	15.20	Off	SNA	0	610	520	636	Off
-4.4	15.20	Off	SNA	0	622	530	601	Off
-4.3	15.20	Off	SNA	0	620	512	602	Off
-4.2	15.20	Off	SNA	0	619	462	604	Off
-4.1	16.00	Off	SNA	0	613	529	560	Off
-4.0	15.20	Off	SNA	0	602	545	584	Off
-3.9	14.40	Off	SNA	0	596	547	571	Off
-3.8	15.20	Off	SNA	0	589	557	572	Off
-3.7	14.40	Off	SNA	0	587	564	571	Off
-3.6	15.20	Off	SNA	0	581	485	581	Off
-3.5	16.00	Off	SNA	0	575	419	566	Off
-3.4	16.00	Off	SNA	0	570	429	534	Off
-3.3	16.00	Off	SNA	0	565	417	570	Off
-3.2	16.00	Off	SNA	0	559	351	547	Off
-3.1	16.00	Off	SNA	0	556	244	547	Off
-3.0	16.80	Off	SNA	0	551	284	544	Off
-2.9	17.60	Off	SNA	0	550	218	543	Off
-2.8	17.60	Off	SNA	0	545	235	538	Off
-2.7	17.60	Off	SNA	0	540	256	530	Off
-2.6	17.60	Off	SNA	0	533	185	551	Off
-2.5	18.40	Off	SNA	0	528	110	520	Off
-2.4	18.40	Off	SNA	0	526	175	522	Off
-2.3	18.40	Off	SNA	0	525	89	523	Off
-2.2	19.20	Off	SNA	0	514	104	503	Off
-2.1	19.20	Off	SNA	0	512	102	497	Off
-2.0	20.00	Off	SNA	0	508	26	499	Off
-1.9	20.80	Off	SNA	0	500	12	493	Off
-1.8	20.80	Off	SNA	0	498	74	488	Off
-1.7	22.40	Off	SNA	0	494	127	480	Off
-1.6	24.00	Off	SNA	0	490	247	449	Off
-1.5	34.40	Off	SNA	0	483	224	461	Off
-1.4	43.20	Off	SNA	0	479	257	449	Off
-1.3	48.80	Off	SNA	0	474	286	443	Off
-1.2	51.20	Off	SNA	0	472	259	444	Off
-1.1	53.60	Off	SNA	0	463	247	428	Off
-1.0	55.20	Off	SNA	0	454	265	408	Off
-0.9	56.80	Off	SNA	0	444	271	382	Off
-0.8	58.40	Off	SNA	0	430	186	377	Off
-0.7	59.20	Off	SNA	0	413	176	353	Off
-0.6	60.80	Off	SNA	0	386	167	322	Off
-0.5	62.40	Off	SNA	0	351	139	309	Off
-0.4	63.20	Off	SNA	0	324	141	260	Off
-0.3	73.60	Off	SNA	0	282	112	236	Off
-0.2	76.00	Off	SNA	0	250	85	207	Off
-0.1	77.60	Off	SNA	0	216	65	175	Off

Pre-Crash Data (Most Recent Event - table 3 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	ETC Flashing	Engine Torque Applied	PRNDL Status (if equip.)	Reverse Gear (Manual Only)	Cruise Control Engaged (if equip.)	Cruise Control Status (if equip.)
-5.0	No	Yes	Drive	No	Not Engaged	On
-4.9	No	Yes	Drive	No	Not Engaged	On
-4.8	No	Yes	Drive	No	Not Engaged	On
-4.7	No	Yes	Drive	No	Not Engaged	On
-4.6	No	Yes	Drive	No	Not Engaged	On
-4.5	No	Yes	Drive	No	Not Engaged	On
-4.4	No	Yes	Drive	No	Not Engaged	On
-4.3	No	Yes	Drive	No	Not Engaged	On
-4.2	No	Yes	Drive	No	Not Engaged	On
-4.1	No	Yes	Drive	No	Not Engaged	On
-4.0	No	Yes	Drive	No	Not Engaged	On
-3.9	No	Yes	Drive	No	Not Engaged	On
-3.8	No	Yes	Drive	No	Not Engaged	On
-3.7	No	Yes	Drive	No	Not Engaged	On
-3.6	No	Yes	Drive	No	Not Engaged	On
-3.5	No	Yes	Drive	No	Not Engaged	On
-3.4	No	Yes	Drive	No	Not Engaged	On
-3.3	No	Yes	Drive	No	Not Engaged	On
-3.2	No	Yes	Drive	No	Not Engaged	On
-3.1	No	Yes	Drive	No	Not Engaged	On
-3.0	No	Yes	Drive	No	Not Engaged	On
-2.9	No	Yes	Drive	No	Not Engaged	On
-2.8	No	Yes	Drive	No	Not Engaged	On
-2.7	No	Yes	Drive	No	Not Engaged	On
-2.6	No	Yes	Drive	No	Not Engaged	On
-2.5	No	Yes	Drive	No	Not Engaged	On
-2.4	No	Yes	Drive	No	Not Engaged	On
-2.3	No	Yes	Drive	No	Not Engaged	On
-2.2	No	Yes	Drive	No	Not Engaged	On
-2.1	No	Yes	Drive	No	Not Engaged	On
-2.0	No	Yes	Drive	No	Not Engaged	On
-1.9	No	Yes	Drive	No	Not Engaged	On
-1.8	No	Yes	Drive	No	Not Engaged	On
-1.7	No	Yes	Drive	No	Not Engaged	On
-1.6	No	Yes	Drive	No	Not Engaged	On
-1.5	No	Yes	Drive	No	Not Engaged	On
-1.4	No	Yes	Drive	No	Not Engaged	On
-1.3	No	Yes	Drive	No	Not Engaged	On
-1.2	No	Yes	Drive	No	Not Engaged	On
-1.1	No	Yes	Drive	No	Not Engaged	On
-1.0	No	Yes	Drive	No	Not Engaged	On
-0.9	No	Yes	Drive	No	Not Engaged	On
-0.8	No	Yes	Drive	No	Not Engaged	On
-0.7	No	Yes	Drive	No	Not Engaged	On
-0.6	No	Yes	Drive	No	Not Engaged	On
-0.5	No	Yes	Drive	No	Not Engaged	On
-0.4	No	Yes	Drive	No	Not Engaged	On
-0.3	No	Yes	Drive	No	Not Engaged	On
-0.2	No	No	Drive	No	Not Engaged	On
-0.1	No	No	Drive	No	Not Engaged	On

System Configuration at Event (1st Prior Event)

Configured for Driver Frontal Airbag	Yes
Configured for Passenger Airbag	Yes
Configured for Driver Retractor Pretensioner	Yes
Configured for Passenger Retractor Pretensioner	Yes
Configured for Left Side Curtain Airbag	Yes
Configured for Right Side Curtain Airbag	Yes
Configured for Front Left Seat Airbags	Yes
Configured for Front Right Seat Airbag	Yes
Configured for Safety Belt Status, Driver	Yes
Configured for Safety Belt Status, Outboard Front Passenger	Yes
Configured for Seat Track Position Switch, Foremost, Status, Driver	No
Configured for Seat Track Position Switch, Foremost, Status, Outboard Front Passenger	No

System Status at Event (1st Prior Event)

Event Number	1
Multi-Event, Number of Events (1,2)	1
Total number of events	2
Time from Event 1 to 2 (Time since last event)(sec)	>5
Complete File Recorded (Yes, No)	Yes
Maximum Delta-V Longitudinal (MPH [km/h])	-0.6 [-1]
Time, Maximum Delta-V, Longitudinal (msec)	96
Maximum Delta-V Lateral (MPH [km/h])	6.2 [10]
Time, Maximum Delta-V, Lateral (msec)	82
Ignition Cycle, Crash	1576
Safety Belt Status, Driver	Buckled
Safety Belt Status, Outboard Front Passenger	Not Buckled
Airbag Warning Lamp, On/Off	Off
Operation System Time (sec)	1608301
Airbag Warning Lamp On Time Before Event (min)	0
Supply Voltage at Event, ACM (V)	14.6
Operation via Energy Reserve	No
VIN at Event (last 8 digits)	HS******
Odometer at Event (km [miles])	20844 [12951.8]

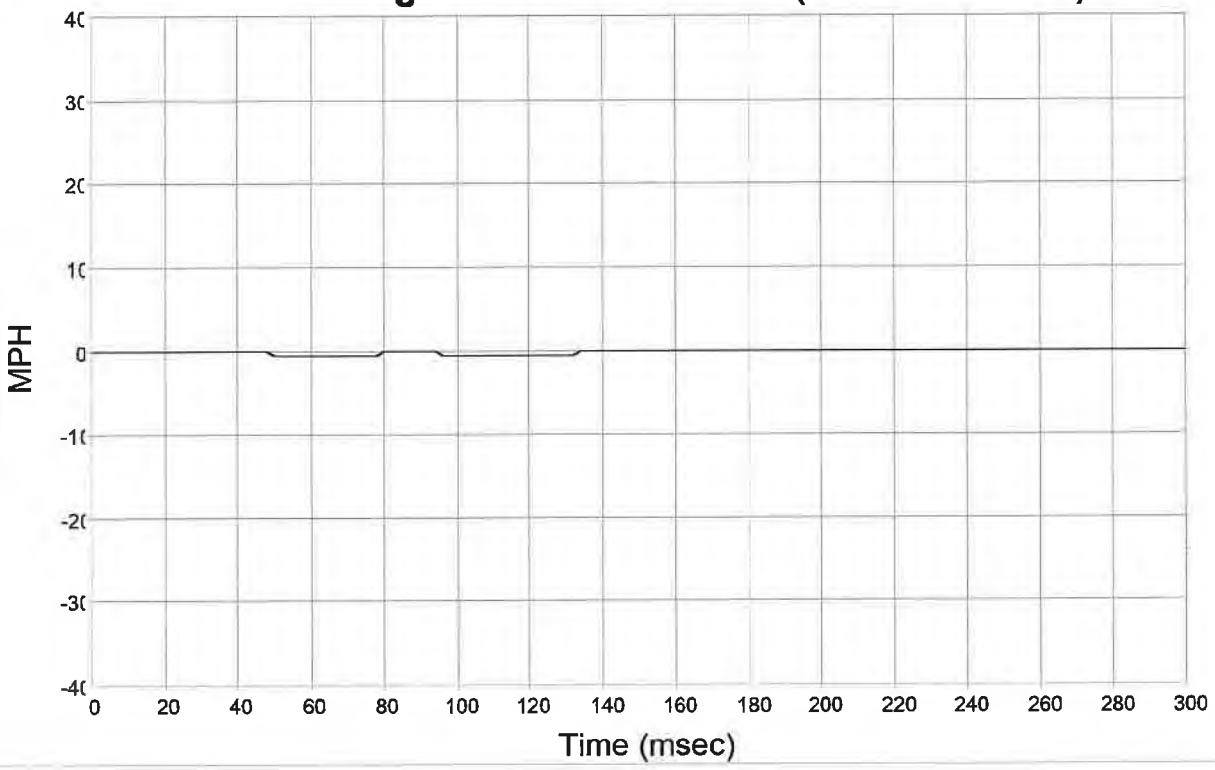
Deployment Command Data (1st Prior Event)

Driver Frontal Airbag Commanded	No
Driver Front Airbag, Time to 1st stage (msec)	0
Driver Front Airbag, Time to 2nd Stage from T0 (msec)	0
Passenger Frontal Airbag Commanded	No
Passenger Front Airbag, Time to 1st stage (msec)	0
Passenger Front Airbag, Time to 2nd Stage from T0 (msec)	0
Commanded Driver Retractor Pretensioner Deployment	Yes
Commanded Passenger Retractor Pretensioner Deployment	Yes
Commanded Left Side Curtain Airbag Deployment	Yes
Commanded Left Seat Airbag Deployment	Yes
Commanded Right Side Curtain Airbag Deployment	No
Commanded Front Right Side Seat Airbag Deployment	No

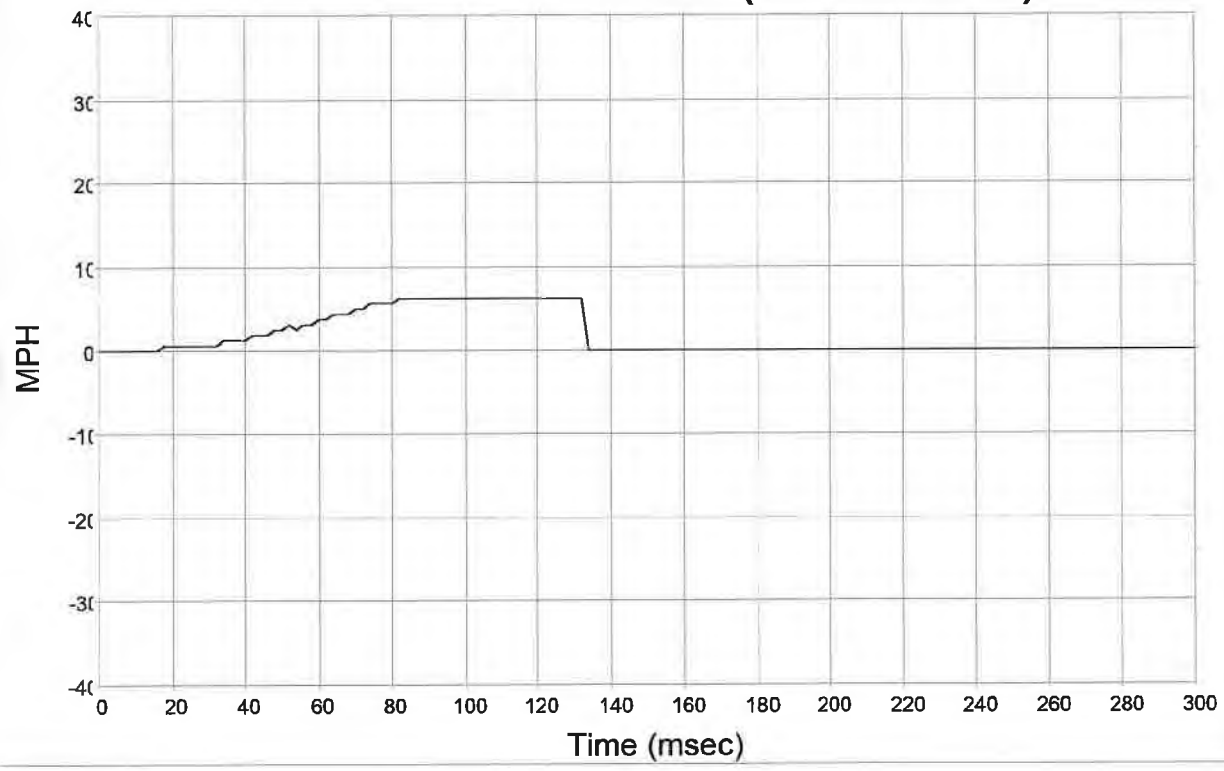
DTCs Present at Start of Event (1st Prior Event)

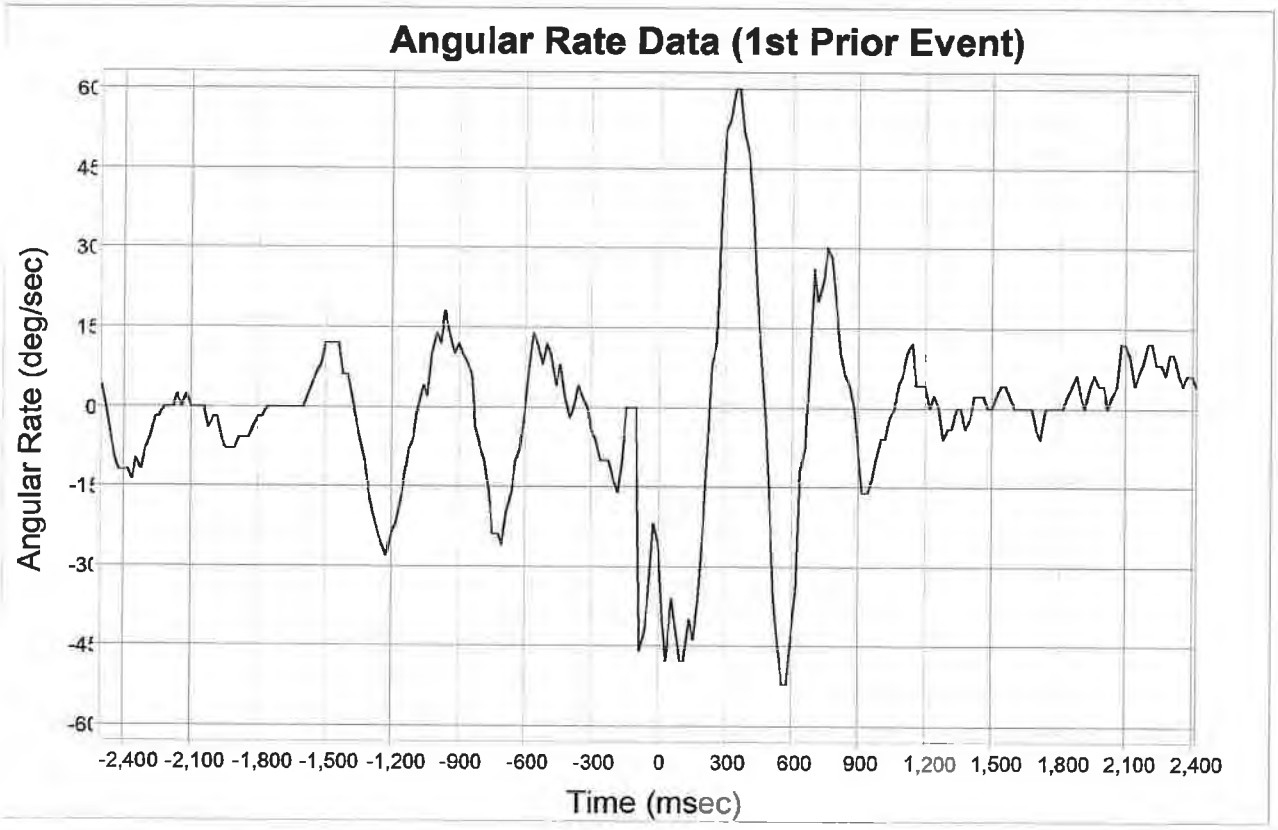
No DTCs Present

Longitudinal Crash Pulse (1st Prior Event)



Lateral Crash Pulse (1st Prior Event)




Angular Rate Data (1st Prior Event)
Angular Rate (deg/sec)
60
45
30
15
0
-15
-30
-45
-60
-2,400 -2,100 -1,800 -1,500 -1,200 -900 -600 -300 0 300 600 900 1,200 1,500 1,800 2,100 2,400
Time (msec)

Longitudinal Crash Pulse (1st Prior Event)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
0	0.0 [0]
2	0.0 [0]
4	0.0 [0]
6	0.0 [0]
8	0.0 [0]
10	0.0 [0]
12	0.0 [0]
14	0.0 [0]
16	0.0 [0]
18	0.0 [0]
20	0.0 [0]
22	0.0 [0]
24	0.0 [0]
26	0.0 [0]
28	0.0 [0]
30	0.0 [0]
32	0.0 [0]
34	0.0 [0]
36	0.0 [0]
38	0.0 [0]
40	0.0 [0]
42	0.0 [0]
44	0.0 [0]
46	0.0 [0]
48	0.0 [0]
50	-0.6 [-1]
52	-0.6 [-1]
54	-0.6 [-1]
56	-0.6 [-1]
58	-0.6 [-1]
60	-0.6 [-1]
62	-0.6 [-1]
64	-0.6 [-1]
66	-0.6 [-1]
68	-0.6 [-1]
70	-0.6 [-1]
72	-0.6 [-1]
74	-0.6 [-1]
76	-0.6 [-1]
78	-0.6 [-1]
80	0.0 [0]
82	0.0 [0]
84	0.0 [0]
86	0.0 [0]
88	0.0 [0]
90	0.0 [0]
92	0.0 [0]
94	0.0 [0]
96	-0.6 [-1]
98	-0.6 [-1]

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
100	-0.6 [-1]
102	-0.6 [-1]
104	-0.6 [-1]
106	-0.6 [-1]
108	-0.6 [-1]
110	-0.6 [-1]
112	-0.6 [-1]
114	-0.6 [-1]
116	-0.6 [-1]
118	-0.6 [-1]
120	-0.6 [-1]
122	-0.6 [-1]
124	-0.6 [-1]
126	-0.6 [-1]
128	-0.6 [-1]
130	-0.6 [-1]
132	-0.6 [-1]
134	0.0 [0]
136	0.0 [0]
138	0.0 [0]
140	0.0 [0]
142	0.0 [0]
144	0.0 [0]
146	0.0 [0]
148	0.0 [0]
150	0.0 [0]
152	0.0 [0]
154	0.0 [0]
156	0.0 [0]
158	0.0 [0]
160	0.0 [0]
162	0.0 [0]
164	0.0 [0]
166	0.0 [0]
168	0.0 [0]
170	0.0 [0]
172	0.0 [0]
174	0.0 [0]
176	0.0 [0]
178	0.0 [0]
180	0.0 [0]
182	0.0 [0]
184	0.0 [0]
186	0.0 [0]
188	0.0 [0]
190	0.0 [0]
192	0.0 [0]
194	0.0 [0]
196	0.0 [0]
198	0.0 [0]

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
200	0.0 [0]
202	0.0 [0]
204	0.0 [0]
206	0.0 [0]
208	0.0 [0]
210	0.0 [0]
212	0.0 [0]
214	0.0 [0]
216	0.0 [0]
218	0.0 [0]
220	0.0 [0]
222	0.0 [0]
224	0.0 [0]
226	0.0 [0]
228	0.0 [0]
230	0.0 [0]
232	0.0 [0]
234	0.0 [0]
236	0.0 [0]
238	0.0 [0]
240	0.0 [0]
242	0.0 [0]
244	0.0 [0]
246	0.0 [0]
248	0.0 [0]
250	0.0 [0]
252	0.0 [0]
254	0.0 [0]
256	0.0 [0]
258	0.0 [0]
260	0.0 [0]
262	0.0 [0]
264	0.0 [0]
266	0.0 [0]
268	0.0 [0]
270	0.0 [0]
272	0.0 [0]
274	0.0 [0]
276	0.0 [0]
278	0.0 [0]
280	0.0 [0]
282	0.0 [0]
284	0.0 [0]
286	0.0 [0]
288	0.0 [0]
290	0.0 [0]
292	0.0 [0]
294	0.0 [0]
296	0.0 [0]
298	0.0 [0]
300	0.0 [0]

Lateral Crash Pulse (1st Prior Event)

Time (msec)	Delta-V, Lateral (MPH [km/h])
0	0.0 [0]
2	0.0 [0]
4	0.0 [0]
6	0.0 [0]
8	0.0 [0]
10	0.0 [0]
12	0.0 [0]
14	0.0 [0]
16	0.0 [0]
18	0.6 [1]
20	0.6 [1]
22	0.6 [1]
24	0.6 [1]
26	0.6 [1]
28	0.6 [1]
30	0.6 [1]
32	0.6 [1]
34	1.2 [2]
36	1.2 [2]
38	1.2 [2]
40	1.2 [2]
42	1.9 [3]
44	1.9 [3]
46	1.9 [3]
48	2.5 [4]
50	2.5 [4]
52	3.1 [5]
54	2.5 [4]
56	3.1 [5]
58	3.1 [5]
60	3.7 [6]
62	3.7 [6]
64	4.3 [7]
66	4.3 [7]
68	4.3 [7]
70	5.0 [8]
72	5.0 [8]
74	5.6 [9]
76	5.6 [9]
78	5.6 [9]
80	5.6 [9]
82	6.2 [10]
84	6.2 [10]
86	6.2 [10]
88	6.2 [10]
90	6.2 [10]
92	6.2 [10]
94	6.2 [10]
96	6.2 [10]
98	6.2 [10]

Time (msec)	Delta-V, Lateral (MPH [km/h])
100	6.2 [10]
102	6.2 [10]
104	6.2 [10]
106	6.2 [10]
108	6.2 [10]
110	6.2 [10]
112	6.2 [10]
114	6.2 [10]
116	6.2 [10]
118	6.2 [10]
120	6.2 [10]
122	6.2 [10]
124	6.2 [10]
126	6.2 [10]
128	6.2 [10]
130	6.2 [10]
132	6.2 [10]
134	0.0 [0]
136	0.0 [0]
138	0.0 [0]
140	0.0 [0]
142	0.0 [0]
144	0.0 [0]
146	0.0 [0]
148	0.0 [0]
150	0.0 [0]
152	0.0 [0]
154	0.0 [0]
156	0.0 [0]
158	0.0 [0]
160	0.0 [0]
162	0.0 [0]
164	0.0 [0]
166	0.0 [0]
168	0.0 [0]
170	0.0 [0]
172	0.0 [0]
174	0.0 [0]
176	0.0 [0]
178	0.0 [0]
180	0.0 [0]
182	0.0 [0]
184	0.0 [0]
186	0.0 [0]
188	0.0 [0]
190	0.0 [0]
192	0.0 [0]
194	0.0 [0]
196	0.0 [0]
198	0.0 [0]

Time (msec)	Delta-V, Lateral (MPH [km/h])
200	0.0 [0]
202	0.0 [0]
204	0.0 [0]
206	0.0 [0]
208	0.0 [0]
210	0.0 [0]
212	0.0 [0]
214	0.0 [0]
216	0.0 [0]
218	0.0 [0]
220	0.0 [0]
222	0.0 [0]
224	0.0 [0]
226	0.0 [0]
228	0.0 [0]
230	0.0 [0]
232	0.0 [0]
234	0.0 [0]
236	0.0 [0]
238	0.0 [0]
240	0.0 [0]
242	0.0 [0]
244	0.0 [0]
246	0.0 [0]
248	0.0 [0]
250	0.0 [0]
252	0.0 [0]
254	0.0 [0]
256	0.0 [0]
258	0.0 [0]
260	0.0 [0]
262	0.0 [0]
264	0.0 [0]
266	0.0 [0]
268	0.0 [0]
270	0.0 [0]
272	0.0 [0]
274	0.0 [0]
276	0.0 [0]
278	0.0 [0]
280	0.0 [0]
282	0.0 [0]
284	0.0 [0]
286	0.0 [0]
288	0.0 [0]
290	0.0 [0]
292	0.0 [0]
294	0.0 [0]
296	0.0 [0]
298	0.0 [0]
300	0.0 [0]

Angular Rate Data (1st Prior Event)

Time (msec)	Angular Rate (deg/sec)
-2500	4.00
-2480	0.00
-2460	-6.00
-2440	-10.00
-2420	-12.00
-2400	-12.00
-2380	-12.00
-2360	-14.00
-2340	-10.00
-2320	-12.00
-2300	-8.00
-2280	-6.00
-2260	-2.00
-2240	-2.00
-2220	0.00
-2200	0.00
-2180	0.00
-2160	2.00
-2140	0.00
-2120	2.00
-2100	0.00
-2080	0.00
-2060	0.00
-2040	0.00
-2020	-4.00
-2000	-2.00
-1980	-2.00
-1960	-6.00
-1940	-8.00
-1920	-8.00
-1900	-8.00
-1880	-6.00
-1860	-6.00
-1840	-6.00
-1820	-4.00
-1800	-2.00
-1780	-2.00
-1760	0.00
-1740	0.00
-1720	0.00
-1700	0.00
-1680	0.00
-1660	0.00
-1640	0.00
-1620	0.00
-1600	0.00
-1580	2.00
-1560	4.00
-1540	6.00
-1520	8.00

Time (msec)	Angular Rate (deg/sec)
-1500	12.00
-1480	12.00
-1460	12.00
-1440	12.00
-1420	6.00
-1400	6.00
-1380	2.00
-1360	-2.00
-1340	-6.00
-1320	-10.00
-1300	-16.00
-1280	-20.00
-1260	-24.00
-1240	-26.00
-1220	-28.00
-1200	-24.00
-1180	-22.00
-1160	-18.00
-1140	-14.00
-1120	-8.00
-1100	-6.00
-1080	0.00
-1060	4.00
-1040	2.00
-1020	10.00
-1000	14.00
-980	12.00
-960	18.00
-940	14.00
-920	10.00
-900	12.00
-880	10.00
-860	8.00
-840	6.00
-820	-4.00
-800	-8.00
-780	-10.00
-760	-16.00
-740	-24.00
-720	-24.00
-700	-26.00
-680	-20.00
-660	-16.00
-640	-10.00
-620	-8.00
-600	0.00
-580	8.00
-560	14.00
-540	12.00
-520	8.00

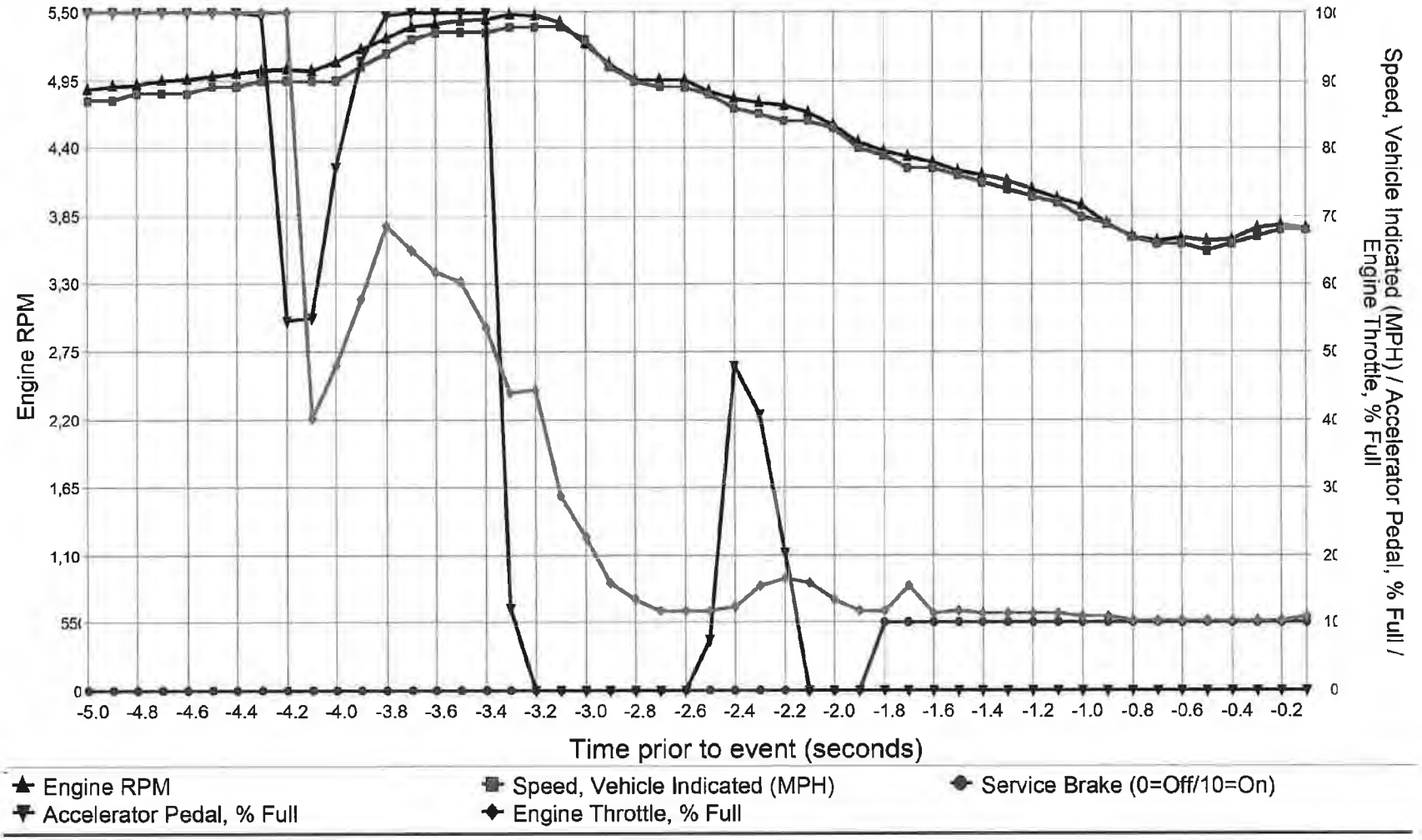
Time (msec)	Angular Rate (deg/sec)
-500	12.00
-480	10.00
-460	4.00
-440	8.00
-420	2.00
-400	-2.00
-380	0.00
-360	4.00
-340	2.00
-320	0.00
-300	-4.00
-280	-6.00
-260	-10.00
-240	-10.00
-220	-10.00
-200	-14.00
-180	-16.00
-160	-10.00
-140	0.00
-120	0.00
-100	0.00
-80	-46.00
-60	-42.00
-40	-34.00
-20	-22.00
0	-26.00
20	-40.00
40	-48.00
60	-36.00
80	-42.00
100	-48.00
120	-48.00
140	-40.00
160	-44.00
180	-36.00
200	-22.00
220	-8.00
240	8.00
260	12.00
280	38.00
300	52.00
320	54.00
340	60.00
360	60.00
380	52.00
400	48.00
420	38.00
440	22.00
460	8.00
480	-2.00

Angular Rate Data (1st Prior Event)

Time (msec)	Angular Rate (deg/sec)
500	-18.00
520	-36.00
540	-46.00
560	-52.00
580	-52.00
600	-42.00
620	-34.00
640	-12.00
660	-8.00
680	8.00
700	26.00
720	20.00
740	24.00
760	30.00
780	28.00
800	18.00
820	10.00
840	6.00
860	4.00
880	0.00
900	-8.00
920	-16.00
940	-16.00
960	-14.00
980	-10.00
1000	-6.00
1020	-6.00
1040	-2.00
1060	0.00
1080	4.00
1100	6.00
1120	10.00
1140	12.00
1160	4.00
1180	4.00
1200	4.00
1220	0.00
1240	2.00
1260	0.00
1280	-6.00
1300	-4.00
1320	-4.00
1340	0.00
1360	0.00
1380	-4.00
1400	-2.00
1420	2.00
1440	2.00
1460	2.00
1480	0.00

Time (msec)	Angular Rate (deg/sec)
1500	0.00
1520	2.00
1540	4.00
1560	4.00
1580	2.00
1600	0.00
1620	0.00
1640	0.00
1660	0.00
1680	0.00
1700	-4.00
1720	-6.00
1740	0.00
1760	0.00
1780	0.00
1800	0.00
1820	0.00
1840	2.00
1860	4.00
1880	6.00
1900	2.00
1920	0.00
1940	4.00
1960	6.00
1980	4.00
2000	4.00
2020	0.00
2040	2.00
2060	4.00
2080	12.00
2100	12.00
2120	10.00
2140	4.00
2160	6.00
2180	8.00
2200	12.00
2220	12.00
2240	8.00
2260	8.00
2280	6.00
2300	10.00
2320	10.00
2340	6.00
2360	4.00
2380	6.00
2400	6.00
2420	4.00

Pre-Crash Data (1st Prior Event)



SNA values will not be plotted on the graph

Pre-Crash Data (1st Prior Event - table 1 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Pre-Crash Recorder Status	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full	Engine Throttle, % Full	Service Brake	Engine RPM	ABS Activity	Stability Control	Steering Input (deg)
-5.0	Complete	87 [140]	100	100	Off	4,875	No	On	12
-4.9	Complete	87 [140]	100	100	Off	4,900	No	On	10
-4.8	Complete	88 [141]	100	100	Off	4,914	No	On	2
-4.7	Complete	88 [142]	100	100	Off	4,946	No	On	-6
-4.6	Complete	88 [142]	100	100	Off	4,955	No	On	-11
-4.5	Complete	89 [143]	100	100	Off	4,978	No	On	-15
-4.4	Complete	89 [143]	100	100	Off	4,999	No	On	-19
-4.3	Complete	90 [144]	99	100	Off	5,024	No	On	-21
-4.2	Complete	90 [145]	55	100	Off	5,039	No	On	-20
-4.1	Complete	90 [145]	55	40	Off	5,032	No	On	-18
-4.0	Complete	90 [146]	77	48	Off	5,095	No	On	-15
-3.9	Complete	92 [148]	93	58	Off	5,203	No	On	-11
-3.8	Complete	94 [151]	99	69	Off	5,293	No	On	-7
-3.7	Complete	96 [154]	100	65	Off	5,386	No	On	-3
-3.6	Complete	97 [155]	100	62	Off	5,404	No	On	-1
-3.5	Complete	97 [156]	100	60	Off	5,432	No	Engaged	0
-3.4	Complete	97 [157]	100	54	Off	5,445	No	Engaged	9
-3.3	Complete	98 [157]	12	44	Off	5,487	No	Engaged	26
-3.2	Complete	98 [158]	0	44	Off	5,474	No	Engaged	34
-3.1	Complete	98 [158]	0	29	Off	5,424	No	Engaged	41
-3.0	Complete	96 [154]	0	23	Off	5,251	No	Engaged	45
-2.9	Complete	92 [148]	0	16	Off	5,086	No	Engaged	58
-2.8	Complete	90 [145]	0	13	Off	4,959	No	Engaged	72
-2.7	Complete	89 [143]	0	12	Off	4,954	No	Engaged	63
-2.6	Complete	89 [143]	0	12	Off	4,957	No	Engaged	39
-2.5	Complete	88 [141]	8	12	Off	4,869	No	Engaged	16
-2.4	Complete	86 [139]	48	12	Off	4,808	No	Engaged	-6
-2.3	Complete	85 [137]	41	15	Off	4,773	No	Engaged	-26
-2.2	Complete	84 [136]	20	16	Off	4,748	No	Engaged	-30
-2.1	Complete	84 [135]	0	16	Off	4,688	No	Engaged	-54
-2.0	Complete	83 [134]	0	13	Off	4,586	No	Engaged	-70
-1.9	Complete	80 [129]	0	12	Off	4,445	No	Engaged	-84
-1.8	Complete	79 [128]	0	12	On	4,377	No	Engaged	-107
-1.7	Complete	77 [125]	0	15	On	4,334	No	Engaged	-111
-1.6	Complete	77 [123]	0	11	On	4,285	No	Engaged	-114
-1.5	Complete	76 [123]	0	12	On	4,217	No	Engaged	-131
-1.4	Complete	75 [121]	0	11	On	4,177	No	Engaged	-134
-1.3	Complete	74 [119]	0	11	On	4,134	No	Engaged	-143
-1.2	Complete	73 [118]	0	11	On	4,067	No	Engaged	-140
-1.1	Complete	72 [116]	0	11	On	3,999	No	Engaged	-141
-1.0	Complete	70 [113]	0	11	On	3,944	No	Engaged	-161
-0.9	Complete	69 [110]	0	11	On	3,786	No	Engaged	-176
-0.8	Complete	67 [108]	0	10	On	3,687	No	Engaged	-180
-0.7	Complete	66 [106]	0	10	On	3,650	No	Engaged	-182
-0.6	Complete	66 [106]	0	10	On	3,676	No	Engaged	-190
-0.5	Complete	65 [104]	0	10	On	3,654	No	Engaged	-190
-0.4	Complete	66 [107]	0	10	On	3,661	No	Engaged	-186
-0.3	Complete	67 [108]	0	10	On	3,751	No	Engaged	-183
-0.2	Complete	68 [109]	0	10	On	3,782	No	Engaged	-175
-0.1	Complete	68 [109]	0	11	On	3,754	Yes	Engaged	-172

Pre-Crash Data (1st Prior Event - table 2 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Raw Manifold Pressure (kPa)	PCM MIL	Yaw Rate (deg/sec)	Wheel Speed LF (RPM)	Wheel Speed RF (RPM)	Wheel Speed LR (RPM)	Wheel Speed RR (RPM)	ETC Lamp
-5.0	95.20	Off	2	897	899	904	910	Off
-4.9	95.20	Off	3	901	905	914	906	Off
-4.8	95.20	Off	3	905	908	912	919	Off
-4.7	93.60	Off	0	910	912	927	915	Off
-4.6	96.80	Off	-2	915	913	919	928	Off
-4.5	95.20	Off	-4	920	915	930	924	Off
-4.4	94.40	Off	-5	924	917	927	938	Off
-4.3	96.80	Off	-5	929	921	936	937	Off
-4.2	92.00	Off	-6	932	926	936	942	Off
-4.1	74.40	Off	-5	935	929	938	941	Off
-4.0	79.20	Off	-4	937	931	946	947	Off
-3.9	88.80	Off	-4	939	934	950	987	Off
-3.8	89.60	Off	-5	943	938	971	1,007	Off
-3.7	88.80	Off	-5	945	939	986	1,015	Off
-3.6	91.20	Off	-7	948	942	1,006	1,010	Off
-3.5	87.20	Off	-8	951	943	1,017	1,015	Off
-3.4	79.20	Off	-10	949	943	1,010	1,015	Off
-3.3	73.60	Off	-10	947	944	1,014	1,027	Off
-3.2	65.60	Off	-10	944	945	1,030	1,030	Off
-3.1	45.60	Off	-9	944	943	1,010	1,024	Off
-3.0	31.20	Off	-8	941	942	960	1,014	Off
-2.9	24.00	Off	-2	937	941	939	973	Off
-2.8	18.40	Off	10	934	942	925	932	Off
-2.7	16.00	Off	28	923	949	920	941	Off
-2.6	15.20	Off	35	916	943	903	937	Off
-2.5	15.20	Off	31	909	932	900	925	Off
-2.4	16.00	Off	27	903	901	883	909	Off
-2.3	19.20	Off	27	897	866	885	895	Off
-2.2	22.40	Off	28	887	818	879	873	Off
-2.1	22.40	Off	27	877	726	899	857	Off
-2.0	19.20	Off	25	868	587	890	819	Off
-1.9	16.00	Off	21	856	328	883	788	Off
-1.8	16.00	Off	18	793	393	836	791	Off
-1.7	18.40	Off	13	811	322	816	796	Off
-1.6	16.00	Off	5	809	590	810	797	Off
-1.5	16.00	Off	2	670	822	795	790	Off
-1.4	15.20	Off	6	600	788	785	775	Off
-1.3	15.20	Off	9	664	670	775	768	Off
-1.2	15.20	Off	9	786	267	765	761	Off
-1.1	15.20	Off	6	775	398	752	740	Off
-1.0	15.20	Off	0	777	515	742	719	Off
-0.9	15.20	Off	-2	764	801	723	690	Off
-0.8	15.20	Off	1	600	502	683	706	Off
-0.7	15.20	Off	-4	646	348	659	708	Off
-0.6	15.20	Off	-7	748	690	682	695	Off
-0.5	14.40	Off	-6	713	659	688	657	Off
-0.4	15.20	Off	-10	439	759	695	690	Off
-0.3	14.40	Off	-14	461	742	719	681	Off
-0.2	14.40	Off	-21	507	699	700	713	Off
-0.1	14.40	Off	-30	83	529	696	704	Off

Pre-Crash Data (1st Prior Event - table 3 of 3)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	ETC Flashing	Engine Torque Applied	PRNDL Status (if equip.)	Reverse Gear (Manual Only)	Cruise Control Engaged (if equip.)	Cruise Control Status (if equip.)
-5.0	No	Yes	Drive	No	Not Engaged	On
-4.9	No	Yes	Drive	No	Not Engaged	On
-4.8	No	Yes	Drive	No	Not Engaged	On
-4.7	No	Yes	Drive	No	Not Engaged	On
-4.6	No	Yes	Drive	No	Not Engaged	On
-4.5	No	Yes	Drive	No	Not Engaged	On
-4.4	No	Yes	Drive	No	Not Engaged	On
-4.3	No	Yes	Drive	No	Not Engaged	On
-4.2	No	Yes	Drive	No	Not Engaged	On
-4.1	No	Yes	Drive	No	Not Engaged	On
-4.0	No	Yes	Drive	No	Not Engaged	On
-3.9	No	Yes	Drive	No	Not Engaged	On
-3.8	No	Yes	Drive	No	Not Engaged	On
-3.7	No	Yes	Drive	No	Not Engaged	On
-3.6	No	Yes	Drive	No	Not Engaged	On
-3.5	No	Yes	Drive	No	Not Engaged	On
-3.4	No	Yes	Drive	No	Not Engaged	On
-3.3	No	Yes	Drive	No	Not Engaged	On
-3.2	No	Yes	Drive	No	Not Engaged	On
-3.1	No	Yes	Drive	No	Not Engaged	On
-3.0	No	Yes	Drive	No	Not Engaged	On
-2.9	No	Yes	Drive	No	Not Engaged	On
-2.8	No	Yes	Drive	No	Not Engaged	On
-2.7	No	Yes	Drive	No	Not Engaged	On
-2.6	No	Yes	Drive	No	Not Engaged	On
-2.5	No	Yes	Drive	No	Not Engaged	On
-2.4	No	Yes	Drive	No	Not Engaged	On
-2.3	No	Yes	Drive	No	Not Engaged	On
-2.2	No	Yes	Drive	No	Not Engaged	On
-2.1	No	Yes	Drive	No	Not Engaged	On
-2.0	No	Yes	Drive	No	Not Engaged	On
-1.9	No	Yes	Drive	No	Not Engaged	On
-1.8	No	Yes	Drive	No	Not Engaged	On
-1.7	No	Yes	Drive	No	Not Engaged	On
-1.6	No	Yes	Drive	No	Not Engaged	On
-1.5	No	Yes	Drive	No	Not Engaged	On
-1.4	No	Yes	Drive	No	Not Engaged	On
-1.3	No	Yes	Drive	No	Not Engaged	On
-1.2	No	Yes	Drive	No	Not Engaged	On
-1.1	No	Yes	Drive	No	Not Engaged	On
-1.0	No	Yes	Drive	No	Not Engaged	On
-0.9	No	Yes	Drive	No	Not Engaged	On
-0.8	No	Yes	Drive	No	Not Engaged	On
-0.7	No	Yes	Drive	No	Not Engaged	On
-0.6	No	Yes	Drive	No	Not Engaged	On
-0.5	No	Yes	Drive	No	Not Engaged	On
-0.4	No	Yes	Drive	No	Not Engaged	On
-0.3	No	Yes	Drive	No	Not Engaged	On
-0.2	No	Yes	Drive	No	Not Engaged	On
-0.1	No	Yes	Drive	No	Not Engaged	On

Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

62 F1 00 00 42 01 03

62 F1 32 36 38 33 30 33 32 31 38 41 41

62 F1 50 0C 05 00

62 F1 51 0F 2D 00 0F 2E 00

62 02 20 04 7A 41 04 11 1D 03 2E 39 12 7F 10 00 00 00 00 C0 00 00 C0 00 00 C0 07 31 43 36 52 52
37 4D 54 32 48 53 36 36 34 32 33 36 7E CF 00 00 00 00

62 F1 8C 54 35 32 4D 44 30 30 35 37 30 31 33 32 37

62 F1 54 00 03

62 F1 90 31 43 36 52 52 37 4D 54 32 48 53 2A 2A 2A 2A 2A 2A

62 02 B1 01 CC 02 02 13 FF 0F 8F 19 00 18 8A 73 00 00 00 B0 06 28 C3 2E 39 1D 04 07 F8 04 F0 00
00 00 00 00 00 33 11 0F 00 00 00 00 00 C0 00 00 00 40 00 C0 00 00 C0 0F 2E C0 82 50 CC 00 80 20
11 80 21 13 80 7F 13 80 7E 13 00 00 00 C0 00 00 00 00 00 C0 00 00 C0 00 00 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 C0 00 00 00 00 00 C0 00 00 C0 00 00 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 C0 00 00 00 00 00 C0 00 00 C0 00 00 C0 00 1F C0 00 00 48
53 2A 2A 2A 2A 2A 2A FF FE FF FF FF 00 C0 00 03 83 F3 00 C0 00 00 C0 00 00 C0 00 00 C0 00 00 00
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62 02 B2 02 CC 01 02 13 FF 0F 0F 19 00 18 8A 6D 00 00 00 B0 06 28 C3 2E 37 1D 04 07 F8 04 F0 00
00 00 00 00 00 33 11 0F 00 00 00 00 00 43 04 00 00 30 00 C0 00 00 10 0F 2E C0 95 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 C0 00 00 00 00 00 C0 00 00 C0 00 00 C0 00 00 C0 00 00 00
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53 2A 2A 2A 2A 2A 2A FF FE FF FF FF 00 C0 00 03 92 F3 00 C0 00 00 C0 00 00 C0 00 00 C0 00 00 00
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62 02 B3 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
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62 02 10 FF FF FF FF FF FF FF FF 03 3D C1 9F 01 A1 3F C0 C0 00 00 C0 00 00

 CS00521621

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00 02 00 00 00 07 00 FF 00 00 00 00 00 CE 2E 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 09
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00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 01 01 CC 00 00 00 00 01 9D C0 A9 00 00 01 F4 FF FF 02 C0 00 01 C0 1B E4 15 00 5F 04
00 02 00 00 00 07 00 FF 00 00 00 00 00 CE 3C 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 0B
EB 00 00 04 FB FF 03 FF FF FF FF FF 5C FF 75 FF FF FF 7D C0 00 00 C0 00 0E D4 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 01 02 CC 00 00 00 00 01 D8 C0 E0 00 00 02 34 FF FF 02 C0 00 01 C0 1F DF 15 0A 5C 15
00 82 00 00 00 07 00 FF 00 00 00 00 00 CE 56 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 0E
0F 00 00 04 FB FF 03 FF FF FF FF FF 5C FF 75 FF FF FF 7D C0 00 00 C0 00 0F 38 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 01 03 CC 00 01 02 00 02 07 C1 1A 00 00 02 88 FF FF 02 C0 00 01 C0 20 DE 15 0A 4F 08
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE 5D 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 10
41 00 00 04 FB FF 03 FF FF FF FF FF 5C FF 75 FF FF FF 7E C0 00 00 C7 14 10 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 01 04 CC 00 01 39 00 02 6A C1 15 00 00 02 BE FF FF 02 C0 00 01 C0 23 DC 15 0A 4E 0A
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE 5F 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 12
2A 00 00 04 FB FF 03 FF FF FF FF FF 5C FF 75 FF FF FF 7F C0 00 00 C7 03 10 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 01 05 CC 00 01 7F 00 02 84 C1 4E 00 00 03 03 FF FF 02 C0 00 01 C0 24 DA 15 0A 4C 0D
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE 58 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 12
FC 00 00 04 FB FF 03 FF FF FF FF FF 5C FF 75 FF FF FF 7F C0 00 00 C6 DD 10 C8 00 00 C0 00 00 00
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00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE 3F 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 14
DC 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 7F C0 00 00 C6 34 11 2C 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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54 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 7F C0 00 00 C6 8F 0F 38 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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57 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 7F C0 00 00 C6 6B 0F 38 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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00 00 00 00 00 00 00 00 00 00 FF FF

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DD 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 70 C0 00 00 C2 35 0E 70 00 00 C0 00 00 00
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A2 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6F C0 00 00 C1 F6 0F 9C 00 00 C0 00 00 00
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E5 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6E C0 00 00 C1 C8 10 C0 00 00 C0 00 00 00
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BA 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 AE 10 C0 00 00 C0 00 00 00
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DA 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 A8 10 C0 00 00 C0 00 00 00
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00 00 00 00 00 00 00 00 00 00 FF FF

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00 00 00 00 00 00 00 00 00 00 FF FF

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AE 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 98 0F 9C 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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B4 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 7C 0E D4 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 01 18 CC 00 07 1D 00 04 0F C0 DC 00 00 04 20 FF FF 00 C0 00 00 C0 23 DC 15 0A 17 09
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00 00 00 00 00 00 00 00 00 00 FF FF

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9C 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 9C 0F 9C 00 00 C0 00 00 00
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71 01 03 01 01 1A CC 00 07 A3 00 04 24 C2 00 00 00 04 37 FF FF 00 C0 00 00 C0 25 DA 15 0A 16 0B
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00 00 00 00 00 00 00 00 00 00 FF FF

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2F 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 8F 0C 7C 00 00 C0 00 00 00
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E5 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 78 10 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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6A 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 70 10 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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0B 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 6D 10 64 00 00 C0 00 00 00
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27 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 69 10 C0 00 00 C0 00 00 00
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2B 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 7B 11 2C 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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C1 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 7A 10 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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00 C2 00 00 00 07 00 FF 00 00 00 00 00 10 38 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 2B
0F 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 85 10 64 00 00 C0 00 00 00
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13 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 85 10 64 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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D0 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 84 10 64 00 00 C0 00 00 00
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00 00 00 00 00 00 00 00 00 00 FF FF

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10 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 87 13 20 00 00 C0 00 00 00
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71 01 03 01 01 2A CC 00 0B 64 00 04 B3 C3 FF 00 00 04 D8 FF FF 00 C0 00 00 C0 29 D6 15 0B 13 10
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 7F 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 2A
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79 00 00 04 FB FF 03 FF FF FF FF FF 48 FF 75 FF FF FF 6D C0 00 00 C1 97 11 2C 00 00 C0 00 00 00
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8B 00 00 04 FB FF 03 FF FF FF FF FF 3F 7E 75 46 82 80 73 C0 00 00 C1 BB 0E D4 00 00 C0 00 00 00
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0B 00 00 04 FB FF 03 FF FF FF FF FF 2F 7E 75 66 A7 80 72 C0 00 00 C1 BD 10 C0 00 00 C0 00 00 00
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FC 00 00 04 FB FF 03 FF FF FF FF FF 2F 7E 75 68 AA 80 74 C0 00 00 C1 C0 0F 38 00 00 C0 00 00 00
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D3 00 00 04 FB FF 03 FF FF FF FF FF 2F 7E 75 67 C5 80 73 C0 00 00 C1 C6 0F 9C 00 00 C0 00 00 00
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71 01 03 01 02 0B CC 00 0F E3 00 05 F1 C5 F9 06 24 02 16 83 87 02 C0 00 01 C0 2F D0 15 0A 13 16
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE E8 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3A
FC 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 6C AE 80 72 C0 00 00 C1 CD 10 64 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 0C CC 00 10 26 00 06 00 C6 0E 05 2F 05 3C 83 AF 02 C0 00 01 C0 2F CF 15 0B 13 16
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE E2 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3B
95 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 6C C2 80 72 C0 00 00 C1 D0 0F 9C 00 00 C0 00 00 00
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71 01 03 01 02 0D CC 00 10 51 00 06 0E C6 21 04 AF 06 27 82 6F 02 C0 00 01 C0 2F CF 15 0A 13 16
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE F4 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3C
59 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 6C D7 80 72 C0 00 00 C1 D2 10 C0 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 0E CC 00 10 79 00 06 2B C6 35 05 3B 06 6B 80 DF 02 C0 00 01 C0 30 CF 15 0A 14 17
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CE FB 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3D
5E 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 69 CA 80 71 C0 00 00 C1 E5 0E D4 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 0F CC 00 10 BD 00 06 3A C6 53 06 52 04 9C 82 3F 02 C0 00 01 C0 2F CF 15 0B 14 16
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 1D 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3D
B1 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 69 B7 80 72 C0 00 00 C1 F4 0E 70 00 00 C0 00 00 00
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71 01 03 01 02 10 CC 00 10 EE 00 06 38 C6 5F 06 55 02 84 85 2F 02 C0 00 01 C0 36 C8 15 0A 17 1E
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 23 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3E
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53 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 69 B7 80 71 C0 00 00 C2 64 10 C8 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 11 CC 00 11 19 00 06 2D C6 88 06 31 03 11 87 37 02 C0 00 01 C0 30 CF 15 00 14 17
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 2A 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 3F
DC 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 66 B9 80 72 C0 00 00 C1 CA 0E D4 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 12 CC 00 11 5D 00 06 27 C6 E6 06 AF 02 90 88 87 02 C0 00 00 C0 30 CF 15 0A 14 17
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 59 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 40
A2 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 5F BD 80 71 C0 00 00 C1 D6 0E 70 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 13 CC 00 11 EA 00 06 66 C6 F3 06 C7 04 95 89 F7 02 C0 00 00 C0 31 CD 15 0A 18 1A
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 74 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 42
C0 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 5E C5 80 71 C0 00 00 C2 46 0E D4 00 00 C0 00 00 00
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71 01 03 01 02 14 CC 00 12 50 00 06 B2 C7 05 06 D9 05 AC 8A E7 02 C0 00 00 C0 38 C7 15 0A 1C 1F
00 C2 00 00 00 07 00 FF 00 00 00 00 00 CF 95 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 43
9A 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 62 CC 80 6F C0 00 00 C3 17 0E CC 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 15 CC 00 12 8C 00 06 D2 C6 DD 06 EE 06 63 8A FF 02 C0 00 00 C0 3D C1 31 18 1C 20
28 C2 00 00 00 07 00 FF 00 00 00 00 00 CF C4 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 43
D1 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 67 CF 80 70 C0 00 00 C2 FC 0F 38 00 00 C0 00 00 00
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71 01 03 01 02 16 CC 00 12 A5 00 06 FE C6 EA 07 01 06 C3 8A 97 00 C0 00 00 C0 39 C6 5E 2F 18 1E
50 C2 00 00 00 07 00 FF 00 00 00 00 00 CF CD 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 44
B1 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 69 D7 80 6F C0 00 00 C2 72 0E D4 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 17 CC 00 12 C8 00 07 1A C6 E6 07 0E 07 09 8A 3F 00 C0 00 00 C0 33 CC 86 43 14 18
5E C2 00 00 00 07 00 FF 00 00 00 00 00 CF F4 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 45
87 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 6C DF 80 70 C0 00 00 C1 C4 0E CC 00 00 C0 00 00 00
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71 01 03 01 02 18 CC 00 13 05 00 07 39 C7 07 07 1A 07 48 8C 5F 00 C0 00 00 C0 30 CE 36 1B 13 17
0F C2 00 00 00 07 00 FF 00 00 00 00 00 10 20 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 46
7E 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 6F D7 80 6F C0 00 00 C1 A8 0E 70 00 00 C0 00 00 00
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71 01 03 01 02 19 CC 00 13 5D 00 07 52 C7 0D 07 28 07 5D 8E 07 00 C0 00 00 C0 30 CE 15 0A 13 17
00 C2 00 00 00 07 00 FF 00 00 00 00 00 10 4E 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 47
7A 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 72 B1 80 6F C0 00 00 C1 AC 0E D4 00 00 C0 00 00 00
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71 01 03 01 02 1A CC 00 13 5A 00 07 59 C7 30 07 36 07 69 8A FF 00 C0 00 00 C0 30 CE 15 0A 14 17
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51 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 6F 56 80 6F C0 00 00 C2 1E 10 C8 00 00 C0 00 00 00
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0A 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 73 51 80 6E C0 00 00 C2 F5 11 2C 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

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00 00 00 00 00 00 00 00 00 00 FF FF
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C7 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 7C 5C 80 6E C0 00 00 C6 CD 10 C8 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 1F CC 00 15 62 00 08 0C C8 0C 07 5F 07 61 7C 01 00 C0 00 00 C0 5B A4 15 0A 52 56
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27 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 7F 5E 80 6D C0 00 00 CA 62 10 64 00 00 C0 00 00 00
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18 C2 00 00 00 07 00 FF 00 00 00 00 00 10 33 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 4E
9C 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 84 5D 80 6D C0 00 00 CB D0 11 2C 00 00 C0 00 00 00
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71 01 03 01 02 21 CC 00 15 45 00 07 ED C7 E3 07 6A 07 5D 7C 09 00 C0 00 00 C0 7D 82 E9 74 63 68
C4 C2 00 00 00 07 00 FF 00 00 00 00 00 10 12 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 4E
6C 00 00 04 FB FF 03 FF FF FF FF FF 23 7E 75 89 5A 80 6D C0 00 00 CD 6C 11 2C 00 00 C0 00 00 00
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71 01 03 01 02 22 CC 00 15 38 00 07 ED C7 F2 07 6D 07 5D 7C C9 00 C0 00 00 C0 90 6F E9 00 6D 75
C4 C2 00 00 00 07 00 FF 00 00 00 00 00 10 00 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 4E
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00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 23 CC 00 15 1C 00 07 E4 C7 DB 07 68 07 5B 7D 29 00 C0 00 00 C0 8F 6F E9 74 72 78
C4 C2 00 00 00 07 00 FF 00 00 00 00 00 CF FE 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 4D
B3 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 8C 64 80 6E C0 00 00 CE 36 10 C0 00 00 C0 00 00 00
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71 01 03 01 02 24 CC 00 15 0A 00 07 EE C7 B3 07 62 07 56 7D C1 00 C0 00 00 C0 96 69 E9 74 6F 7E
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0C 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 8B 64 80 6E C0 00 00 CE 3F 10 64 00 00 C0 00 00 00
00 00 00 00 00 00 00 00 00 00 FF FF

71 01 03 01 02 25 CC 00 14 AD 00 07 DD C7 95 07 5D 07 53 7E 09 00 C0 00 00 C0 A3 5C E4 72 70 85
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9C 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 89 61 80 6F C0 00 00 CF 22 10 64 00 00 C0 00 00 00
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71 01 03 01 02 26 CC 00 14 53 00 07 B5 C7 6B 07 55 07 4C 7E 21 00 C0 00 00 C0 9C 62 D8 6C 6F 70
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97 C2 00 00 00 07 00 FF 00 00 00 00 00 CF E2 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 48
C6 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 8B 52 80 6F C0 00 00 CD 85 10 C8 00 00 C0 00 00 00
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71 01 03 01 02 28 CC 00 13 A8 00 07 59 C7 53 07 4D 07 41 7D 31 00 C0 00 00 C0 67 98 94 4A 5D 4E
6C C2 00 00 00 07 00 FF 00 00 00 00 00 CF DC 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 48
6E 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 8F 4D 80 6F C0 00 00 CC 1A 10 C0 00 00 C0 00 00 00
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71 01 03 01 02 29 CC 00 13 AF 00 07 5B C7 4F 07 47 07 3B 7D 99 00 C0 00 00 C0 A3 5B 87 43 73 C2
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19 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 92 57 80 6F C0 00 00 10 49 10 C0 00 00 C0 00 00 00
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71 01 03 01 02 2B CC 00 13 87 00 07 54 C7 3E 07 37 07 2A 7D F9 00 C0 00 00 C0 DB 23 E9 74 76 C2
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C4 C2 00 00 00 07 00 FF 00 00 00 00 00 CF DB 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 47
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5C 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 93 78 80 6F C0 00 00 10 33 0F 9C 00 00 C0 00 00 00
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71 01 03 01 02 2F CC 00 13 32 00 07 2D C7 1F 07 12 07 18 81 47 00 C0 00 00 C0 DB 24 E9 74 77 C2
C4 C2 00 00 00 07 00 FF 00 00 00 00 00 10 04 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 46
6A 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 94 96 80 6F C0 00 00 10 35 0F 38 00 00 C0 00 00 00
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71 01 03 01 02 30 CC 00 13 24 00 07 14 C7 24 07 09 07 12 81 67 00 C0 00 00 C0 DB 23 E9 74 77 C2
C4 C2 00 00 00 07 00 FF 00 00 00 00 00 10 14 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 46
0F 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 94 96 80 70 C0 00 00 10 37 0F 9C 00 00 C0 00 00 00
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71 01 03 01 02 31 CC 00 13 0B 00 07 1C C7 0F 07 01 07 06 80 D7 00 C0 00 00 C0 DB 24 E9 74 77 C2
C4 C2 00 00 00 07 00 FF 00 00 00 00 00 10 18 00 0F 1F FF C0 FF 60 C3 FF FF 78 FF FF FF FF FF 45
C5 00 00 04 FB FF 03 FF FF FF FF FF 22 7E 75 96 8F 80 70 C0 00 00 10 48 10 64 00 00 C0 00 00 00
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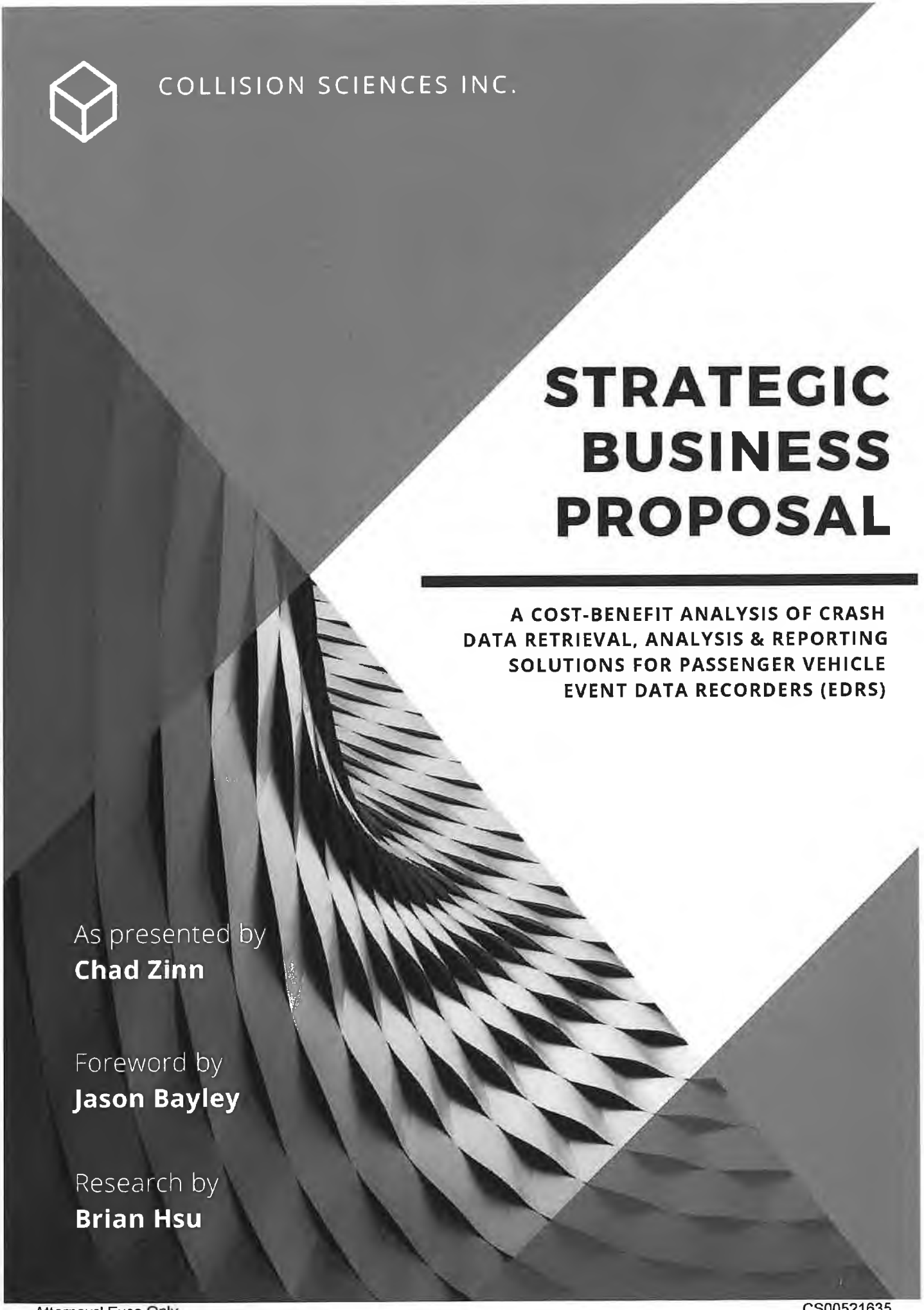


As presented by
Chad Zinn

Foreword by
Jason Bayley

Research by
Brian Hsu

PROVIDING DATA-DRIVEN INTELLIGENCE AT SCALE

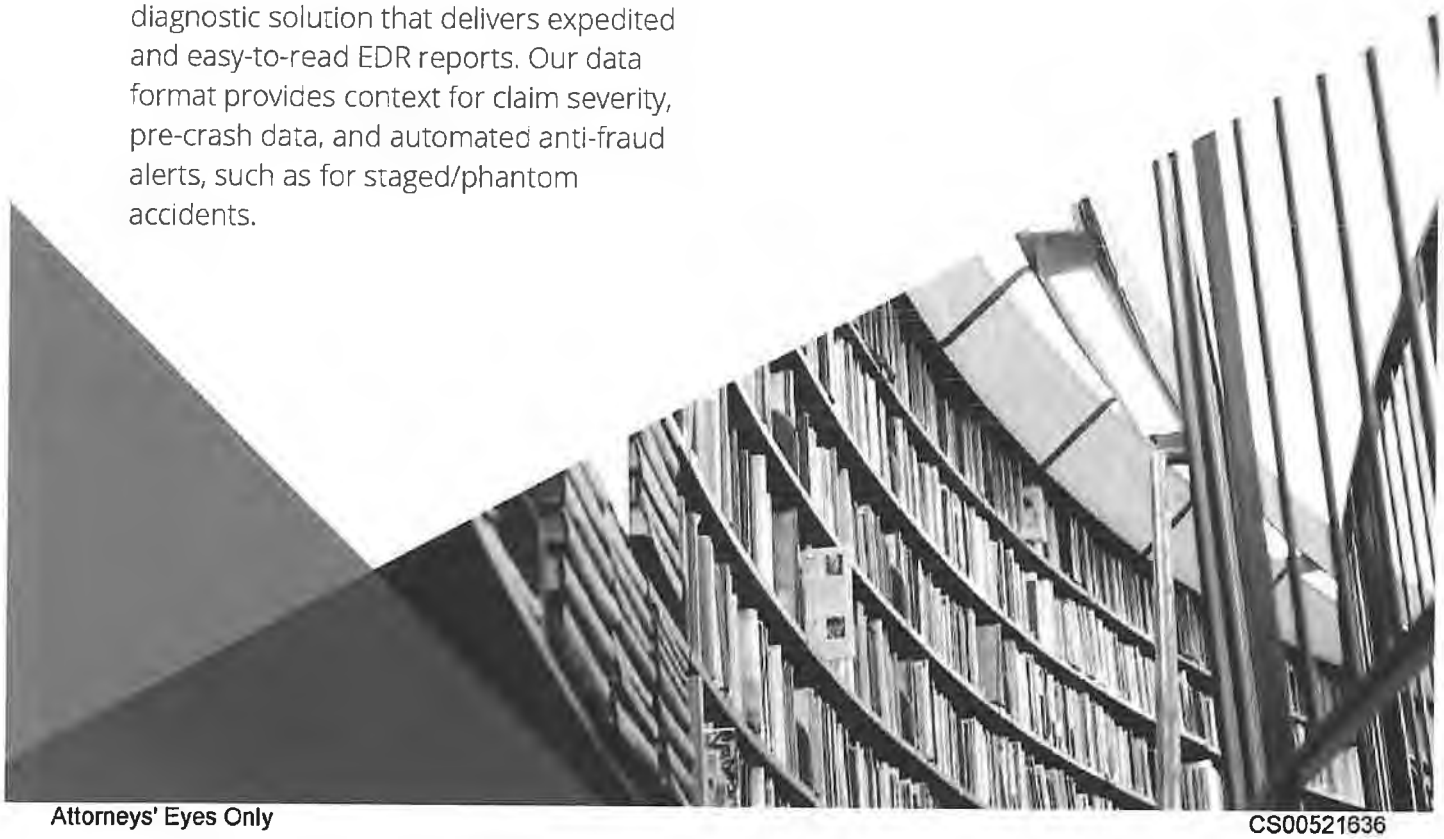
The engineering team at Collision Sciences spent three years researching and developing an industry changing product that enables scaled and intelligent access to vehicle black box data. By empowering insurance companies with routine anti-fraud and liability evidence, we are helping to significantly reduce overall claim/investigation costs and inefficiencies.

With our proprietary CrashScan app and On-Board Diagnostic (OBD) adapter in the hands of field appraisers, DRPs and SIU teams, we facilitate proactive preservation and cloud data analysis for all supported vehicles (75% and growing).

Our tech is the world's first cloud-based diagnostic solution that delivers expedited and easy-to-read EDR reports. Our data format provides context for claim severity, pre-crash data, and automated anti-fraud alerts, such as for staged/phantom accidents.

The data provides a means to deter, detect, deny and prosecute auto claim fraud, providing referrals and evidence for SIU fraud investigations. The data and reports can be used to verify claimant credibility or discredit statements, validate repair and injury severity claims, and also assist with liability or tort claims by providing evidence for fault determination.

Collision Sciences has developed strong partnerships with multi-national data providers and integration partners to scale and deliver its solution globally.



1.0 Extracting Maximum Value from Black Box Data & Solutions

A Cost-Benefit Analysis of Crash Data Retrieval, Analysis & Reporting Solutions for passenger vehicle Event Data Recorders (EDRs)

Introduction

Collison Sciences provides the world's first and only "blackbox to cloud" technology, enabling the ingestion of EDR data that can support many insurance-related functions; most notably for enhanced fraud intelligence, considering this document is prepared to help guide an SIU cost-benefit analysis. The analysis herein explores the various approaches to acquiring and utilizing EDR data. We encourage the reader not to consider the Collision Sciences solution as a direct comparison to the Bosch tool, since many of the financial and operation benefits of using the Collision Sciences solution will be missed. For the purposes of this proposal, a direct analysis has also been included.

Executive Summary

The Collision Sciences solution was developed by a team of professional engineers, automotive experts and accident reconstruction professionals who have used the Bosch CDR system, and made sense of the data over the last 15 years. The Collision Sciences EDR solution was developed to enhance the overall insurer and end-user experience in every possible way.

Collision Sciences provides a very affordable cloud-connected hardware kit that enables inexpensive distribution of equipment for crash data collection at scale. Data collection at scale provides a means for a new factual fraud intelligence data source. And, Collision Sciences provides more than just a cloud-enabled Crash Data Retrieval Kit; in fact it provides 3 EDR kits built into one by including Hyundai & Kia support as well, while also providing significant human resource benefits through its user friendly data collection solution, data contextualization and easy-to-read PDF reports. Data collection is recommended through the first vehicle touch point, such as field appraisers, adjusters, and DRPs, to proactively preserve data early in the claim; and of course via SIU as needed.

Traditionally, insurers have relied on outside experts, due to the cost and complexity of Event Data Recorder (EDR) systems and their respective data interpretation. Ongoing training is commonplace since the interpretation of the resultant information is technically challenging and time consuming (see details that follow). Some insurers have opted to train a few dedicated personnel for EDR retrieval; however, this option does not solve the logistical issues with collecting data following any accident, negating any meaningful fraud intelligence opportunity. The Collision Sciences solution enables both data collection at scale, with the added benefit of cloud-enabled "big data" and with a 10x reduction in cost, compared to hiring an outside expert.

This cost-benefit analysis will show that the Collision Sciences solution provides significant value to an insurer, and its SIU, whether or not Bosch CDR kits have already been purchased.

The Collision Sciences solution can facilitate immense savings for an insurer if utilized at scale, from a claims efficiency, settlement resolution and fraud management perspective. Even as a direct replacement for the Bosch tool for 50 SIU users, the upfront cost of the Collision Sciences solution is approximately $460,000 cheaper upfront, and estimated to be $500,000 cheaper per year, when considering the true human resource costs involved with proper data analysis and reporting.

To directly compare and assess the value of an EDR data retrieval implementation, Bosch CDR versus Collision Sciences, a Cost-Benefit analysis must consider the following important factors:

- Personnel / Human Resource cost with extracting meaning from the data
- Fixed upfront hardware and training costs
- Ongoing software license costs
- Ongoing training / education costs

2.0 Collision Sciences: Value-based Business Models

Implementation:
Collision Sciences recommends equipping field personnel beyond the SIU, such as field appraisers or adjusters (as well as Direct Repair Providers (DRPs)) where significantly more data can be collected, preserved, and/or cloud analyzed; thus providing a new intelligent data source for SIU. For a DRP implementation, we recommend that insurers request that the 2-minute scan be performed as part of the $90 pre-scan, as an "independent pre-scan".

Collision Sciences Solution vs Hiring Outside Engineer
Typically expert engineers charge $225 per hour, costing insurers up to $5000 for a field visit and a written "Reconstruction Report". Organizations using the CS solution see value through a 10x reduction in the costs of preserving crash data and a acquiring meaningful report, when compared to an outside expert. Preserve data at the outset of the claim before the vehicle is repaired or scrapped. Example use case: tort claim filed up to 2 years after an accident.

Business Model:
With the CS Solution, your organization can preserve maximal crash data to the cloud for free after a one-time low cost purchase of a $300 EDR kit. Access Collision Sciences "Claims" reports as-needed for 1/10th of the cost of an expert. Example cost: $300/report with subscription (negotiable at scale), or ad-hoc for $475/report. Subscriptions include PDF Reports and access to the structured data via APIs.

Value:
This model provides up to $2000 value per vehicle scan (data preservation) and approximately $4500 in savings if purchasing an ad hoc report on-demand for $475, when comparing to costs of an outside expert. Accessing a Collision Sciences "Claims" reports as-needed for 1/10th of the cost of an expert provides incredible value.

Fraud Intelligence or Big Data Program

Beyond the value in simply preservation of data for the "Claims" PDF Report generation, the insurer can subscribe to have the cloud data analyzed through algorithms and have alerts pushed directly to their internal system. For each scan, the insurer will receive Collision Sciences derived alerts, a 1-page PDF "Exception/Summary" Report, and the related raw structured data for their system. The raw data can be used to generate new SIU referrals, cross-reference known reported circumstances, create new scoring rules, reduce false positives from current rules, judge referral acceptance, and more.

Business Model:
(Customizable/Negotiable)
Distribute the affordable hardware to capture vehicle scan data for all possible accidents. A scan featuring crash data records will be analyzed in the cloud (possibly analyzed against provided claim data). Example cost: $50/scan with subscription (negotiable at scale).

Value:
For the same cost of equipping just one in-house dedicated EDR person with all 3 EDR kits ($20,000), instead, 73x more personnel could be equipped with Collision Sciences kits. Thus, where one in-house SIU person user could accomplish approx. 50 - 200 scans per year, by instead equipping appraisers, adjusters and DRPs (body shops), there is potential to proactively reach all post-collision vehicles, providing a greater opportunity to preserve crucial data and flag fraud.

Collision Sciences Hardware/Software provides value to SIU or active Bosch EDR users

The Collision Sciences hardware and software solutions could be a replacement for the Bosch tool, but also could be used as a complementary tool. The CS solution provides value to an organization whether or not they already have invested in the Bosch EDR tool(s) for any number of users. Accident Recon experts are using our tool to compliment their in-house solutions. For example, whether an insurer is equipping Bosch CDR users with the CS tool would provide the following features and benefits:

- Adds Hyundai and Kia support, valued at $13,000 and $2000/year alone. Even if the decision is made to equip every SIU member with a Bosch kit, there is still a highly viable business case for equipping all SIU members with the CS tool to have access to the Hyundai/Kia crash data on-demand as well.
- SIU User could use Bosch tool AND CS tool to scan vehicle, providing the future option to purchase the "interpreted data" CS report if needed or desired, likely to save the user 6-10 hours of time to analyze, interpret and document the meaning of the data
- Use of the CS tool preserves data to the cloud, providing the option of big data for analytics and optional SIU referrals
- Preserving data to the cloud reduces risk of data loss and evidence spoliation by using built-in evidence chain of custody best practices

- SIU user would have a backup Crash Data Tool if the Bosch CDR does not work, which through field testing has been seen on various vehicles, Ex. Dodge Caravan and other random vehicles
- The current limitations of the CS solution are that an internet connection is required (such as tethered from a nearby wifi network or mobile device). And while the CS solution provides 10% greater "on the road support", a few select vehicle makes/models supported by Bosch are not supported by the CS tool (Ex. Volvo, Fiat). Where data retrieval is imperative, as a compliment to the CS tool, a Bosch Tool or outside expert can be used.
- The CS Tool actually incorporates the main Bosch "pin changer" adapter required for many MS-CAN Ford vehicles; where a user may think the Bosch tool is not functioning and fail to retrieve data, since the VIN can and must be retrieved from the vehicle before the adapter is used (with no warning messages), with the CS tool, the data is collected automatically. Other Bosch software bugs are known.
- Collision Sciences is committed to invest in technology improvement; further increasing vehicle support through continuing to add support that the Bosch tool does not cover; for Subaru, Land Rover/Jaguar, and Mitsubishi.

Recommended Contract Term (Long Tail Claims Benefit)

Tracking value through usage in tort or long-tail type claims would require a 3 to 5 year tracking term. For example, an insurer may want to track if a tort claim develops over the 2 years following, and whether the data was helpful. Utilizing in-house data on open cases could also help an insurer to estimate the usage value over the long term.

3.0 The Value of Data in the Claims Process

The Collision Sciences technology enables insurance carriers significant financial and operational benefits. Research has show that the use of data, especially early on, has significant impact at all levels.

State of Insurance Fraud

Insurance industry estimates generally put fraud at about 10% of the property/casualty insurance industry's incurred losses and loss adjustment expenses each year. Surveys by the Coalition Against Insurance Fraud have shown that Insurers have experienced a 20% to 50% reduction in fraud loss through implementing new technology. Further, studies of new fraud technology implementations indicate insurers have experienced a 5-6 times ROI for spend, as well as a 50% increase in fraud detection. Measurable outcomes may include: claimant withdrawing an application, ceasing communication, or failing to submit documentation.

Implementing Collision Sciences solutions provides insurers the opportunity to deter, detect and prosecute the 10% of claims that are estimated to be fraudulent.

More Data, Earlier

While many property and casualty (P&C) carriers have incorporated data and analytics into their application and underwriting processes, few have integrated data deeply into their claims process.

To assess the effect of having more data earlier in the claims process, LexisNexis® conducted a study of more than 10 million features from A.M. Best's top 20 carriers. The results showed that having more data, earlier, had considerable benefits to claims outcomes. For third-party bodily injury settlements, the study found that more data earlier resulted in:

- 15–25 percent lower severity payments
- 25–49 percent lower attorney involvement
- 5–15 percent shorter cycle times

Similar results were obtained for third-party property damage claims:

- 10–15 percent lower severity payments
- 8–15 percent shorter cycle times

The impact of telematics data on claims outcomes is well documented. In the report by OCTO Telematics "Optimizing Claim Organizations' Financial Results Through Telematics", the following findings were presented. Insurers have claimed:

- 30% reductions in indemnity costs
- 14% reductions in time to settle claims
- 20% reductions in claims frequency, and
- up to 80% reduction in fraud.

The Collision Sciences technology will help the claims process to evolve from its current state to enhanced crash notification, superior fraud detection, touchless claims, and eventually to proactive claims mitigation.

4.0 Estimated SIU Implementation Costs

Direct Comparison of Collision Sciences vs Bosch CDR Tool

Example Goal: 3500 Reports for SIU

In the Scenario where the Collision Sciences solution is reduced to a direct comparison to the Bosch tool, based on cost to extract a specific number of reports, the findings show that the Collision Sciences solution not only provides better value, but also reduces the time to receive the information, and reduces the risks of analysts making mistakes. The upfront cost of the

Collision Sciences solution is approximately $460,000 cheaper than Bosch, and expected to be $500,000 cheaper per year, when considering the true human resource costs involved.

Collision Sciences Subscription	**Bosch Tool, Training & Human Resources**
Upfront Costs of CS Tool For 50 SIU users @ $300 per kit = **$15,000** **Estimated Ongoing Costs** *Claims Reports* Service Level: 3500 claims / year) * ($300/ full report) = **$1,005,000** ***Added Benefit of CS Cloud-analysis (*non-direct comparison):*** *Fraud Intelligence* Raw Data / Push Alerts / /Exception Reports: Service Level 3500 scans @ $50/scan = **$175,000.**	**Upfront Costs of Bosch Tool & Training** Fixed costs: $7500 / kit * 50 users = $375,000 Initial Training: $425 / user + travel costs = $2000 / user = $100,000 Total: **$475,000** **Estimated Ongoing Costs** Bosch Annual License Fee: $1050 *50 = $52,500 Annual training / conferences: Avg $1000 / user /year Total Ongoing Fixed Costs: **$102,500 / year** **Estimated Human Capital Cost** *for Training / Report Review / Report Analysis / Written Summary / Ongoing review & analysis of Cash Data versus case circumstances: Per case: 10 hours @ $40 / hour = $400. Example: 3500 cases * $400 = $1.4M / year
Total: $15,000 upfront, $1,005,000 / year	**Estimated Total:** $475,000 upfront, $1,500,000 / year
Added Benefits of CS Solutions: • Option to add users at nominal cost • Preserve more data proactively • Use data in AI for • Analyze more accidents via cloud automation to flag more fraud/liability • New internal data source for predictive analytics, Actuarial or Underwriting data science	**Comparison:** • Does not include access to Hyundai & Kia vehicles. • No viable business option to expand program beyond SIU. Adding each Bosch kit is a high upfront, and ongoing expense.

Details/Justification for Human Resource Estimations

Insurers equipping SIU team members with the Bosch tool has long been a debated decision. The human resource costs associated with training, data collection, interpretation, analysis and documentation in report form **must not be underestimated**. The detailed requirements and cloud performance of the Collision Sciences system are documented below. **Review the difference between the sample Bosch CDR Report and Collision Sciences Report to realize the value.** Also to consider, if equipping users with the Bosch system only, there is the further logistical and cost issue with either sharing or additionally training users on the Hyundai and Kia EDR tools; Hyundai and Kia making up a significant 10% of vehicle market share.

Typically accident reconstruction experts are tasked by insurers with retrieving and reporting on crash data findings. These professional experts perform the task about once or twice per week and attend annual training courses and conferences. A crash data analyst must become familiar with how to interpret crash data by OEM. The analyst must add or understand context, make notes and document that context in report format. And the analyst must be able to understand engineering terms and perform calculations to document its full meaningfulness. Once the the basic interpretation is completed, further analysis against reported circumstances, as well as accident reconstruction and injury analysis is usually performed.

The following is a detailed list of the complicated tasks that would generally be required when reviewing, analyzing, interpreting and extracting meaning from a typical Bosch CDR report.

***Spoiler Alert**: the listed tasks, calculations, contextualization, and explanations are automatically performed and displayed in the Collision Sciences "Claims" Report, thus saving insurers both time and money; where the turnaround time is also instant (as opposed to days waiting), and the cost associated with human resource allocation is nullified.*

A crash data analyst must learn to be proficient at the following (RE: Bosch CDR Reports):.

- Ordering multiple crash events (since events and their respective data are not well organized and are inconsistent by OEM/vehicle model). Ordering events requires:
    - Identifying ignition cycles for all recorded events (if available) and the ignition cycles at the time of data imaging (download/retrieval).
    - Calculating event recency, by using the ignition cycle data for each event and performing a subtraction calculation for ignition cycles at download minus the ignition cycles at event. For events with distinct ignition cycles, the analyst must treat as separate events (Most Recent, 1st Prior, 2nd Prior...etc). For events sharing ignition cycles, the analyst must determine event order by analyzing the 5.0 seconds of pre-crash data (checking for data overlap, such as common speeds, etc). An example ordering could be: Most Recent, 1st Prior (1st Impact), 1st Prior (2nd Impact), 2nd Prior, where the vehicle had 4 distinct crash records, with two of those belonging to the same group.
    - Lastly, linking crash events for rollover or side impact events (which are inconsistent by OEM and vehicle model) as well as linking pre-crash data to severity data (also inconsistent by OEM and vehicle model).

- Calculating and interpreting severity. Requires calculating resultant delta-v values, which requires an understanding of the difference between longitudinal and lateral acceleration, calculating the resulting vector components to get impact angle. It also requires the proficient use of positive and negative accelerations and understanding which are front/rear and left/right. This information is used to validate crash event data to actual visible damages to corroborate evidence. The analyst must then also understand the severity context. Example: how severe was a -24 km/h impact? Severity units also vary by OEM and vehicle model, for example: g-force or delta-v. Requires experience, research and technical knowledge to extract context and case applicability.
- Understanding how to interpret the information in the pre-crash data. For example, knowing that the brake or accelerator pedal is applied between time interval recordings, where speed, engine rpm and steering angle are recorded at specific intervals.
- Adding context to steering (left/right). Not all OEMs use the same left/right convention.
- Adding context to braking. The accelerator pedal (% applied) is provided by the Bosch CDR Report but it does not calculate the brake pedal %. The analyst must add context to braking. For example, they must use speed reductions to perform complex calculation to understand braking efficiency.
- Understanding the seatbelt and airbag sections (system status / status at crash) and that there are inconsistencies between OEMs (terminology, supported features/functions, etc). For example, the analyst must understand that a passenger's seat belt status indicating "not buckled" does not mean there was no passenger. It can complicated and confusing to interpret the meaning in certain cases.
- The user must often carefully read the "data limitations" section to understand the implications of the specific vehicle's data. Often the training course notes must be referred to.
- Understanding the meaning of the various technical data sections, being careful not to misinterpret information
- Checking work for any possible miscalculations.
- Bosch Software also requires constant updates, i.e. human activity/resources.

In addition to extracting and organizing the EDR information, the Collision Sciences Report contextualizes the data and does the following (to name a few):

- Automatically analyzes the data and flags known fraud/liability issues.
- For the most recent event(s), predicts total loss or repairable condition. Uses the largest crash pulse component and predicts approximate repair estimates using a range of inputs, including market valuation APIs. If airbag deployment or rollover events are found, they are factored in the estimate as well.
- Determines the largest crash pulse component ever recorded in the most recent event(s) to use for occupant injury prediction. Estimates relative 3rd party injury risk based on largest crash pulse recorded on the 1st party vehicle and a conservation of momentum calculation.
- Has the ability to analyze against provided claims and reported data to provide more specific, automated accident reconstruction and injury causation reports

The human resource time-based costs are estimated in Table 1 (below) as taking up to 10 hours per file. We have attached for reference comparable Bosch CDR Reports and Collision Sciences "Claims" Reports to exhibit the difference.

Table 1: Comparison of EDR Retrieval / Reporting Solutions

	Collision Sciences Solution (Cost/Value)	Comparable Cost ($) - Traditional	Comparable Cost ($ and human resources)
Personnel System Features	SIU or Appraisers: Ex. In-house personnel with Collision Sciences Solution	Local Outside Expert (Forensic Engineer)	In-house insurance trained EDR personnel Ex. SIU only
EDR Hardware / Software License - Only field Kit cost considered - Full direct to module kit is $15,000 US	$300 Kit. No License Fee. Includes: Bluetooth OBD adapter, cable extender, 7" Android tablet, soft carrying case.		Bosch CDR Pro Tool + laptop ($7500 + $1050 / year license), Hyundai & Kia Tools ($13,000 + $1000 / yr license). Total: $20,000 + annual license fee ($2000 / year)
Data Preservation / Training	Easy to use and automated app. Training: 3 minute video. Automatic updates on server side	Travel and Inspection @ $220/hour, approx. fee: $1500 - $2000	Crash Data Group has a 4-hour online user training for field use of CDR tool: $150. *Software requires constant updates, i.e. human activity/resources.
On-site Data Review & Understanding of Data	Easy to Understand. Real-time data context and summary in-app No Training Required; but Pre-recorded on-demand webinars available.	Comparable to verbal report from Engineer. Experts typically attend annual conferences and training.	Bosch has training course to help understand the PDF reports by OEM. 3-day insurance data application course for $450 (course in California Dec. 2018) Cost: 24 hours human capital + travel expenses). Estimated average staff training cost per user: $1000 / year
Basic "Easy to Read" EDR PDF Reports 	Cost: usage based & value-based pricing	Written Summary Report costs $2000 - $3000. Total cost incorporating field data collection: $4000 - $5000	Human review of EDR report, referring to course notes, conducting analysis and written summary of findings. *Estimated staff hours and turnaround for task: 4 hours.
All-inclusive	Automated	Comparable Expert	Requires research &

PDF Report (Loss Predictions, Fraud Alerts, Recon, & Statistical Biomechanical Injury Information) 	$300 per report. Subscribe to service level required.	Reconstruction & Bio Research Report costs: $8000 - $10,000.	analysis, and ongoing human review of EDR data versus reported circumstances. *Estimated hours for task: 5 hours over life of file.
Added value: Big Data - Internal Data Source	Automated		Would require data entry task and in-house custom software (like NHTSA). *Estimated hours for task: 1 hour.
Added Value: Big Data is analyzed in cloud to provide SIU referrals (additional alerts if given reported circumstances)	Automated		Requires ongoing human review of EDR Summary report, versus reported circumstances.
Cost Per Use & Comparable Value	**Turnaround Time:** Instant. **Total cost per use**: $300 per report (can be via API call for PDF) *no limit to data preservation/cloud storage *includes fraud intelligence program, big data for predictive analytics **Annual requirement**: Service level agreement for % of written premium or % claims. **Initial cost**: $300 per kit for any user (appraiser, adjuster, DRP etc).	**Turnaround Time:** 3-5 days. **Estimated Cost per use:** $4000 - $5000 **The Collision Sciences "Claims" Report provides the comparable value of an expert report costing:** $8000 - $10000	**Turnaround Time:** 1-2 days. **Estimated cost per use for SIU:** Year 1: $680 (Bosch kit only), $860 (if including Hyundai/Kia) Year 2 and on: $460 *assumes user does 50 CDR downloads / year and $40/hr for the estimated annual costs of $23,000 **Initial cost**: $11,020 for just Bosch Field Kit + training (or $20,000 with Hyundai/Kia kits) *data collection limited to SIU use, risk of mistakes

Table 2: Collision Sciences Value-based Pricing Chart

	Pay per use, no subscription. ***Short-term Pilot Pricing** On-demand, Ad hoc use.	**PDF Report Subscription Options** **Service Level:** Usage on % of Claims	**Big Data & Fraud Intelligence Subscriptions** **Service Level:** Fee applies to any scans with actual Crash Data Records
APIs for Services			
Supported Vehicle Check	FREE	FREE	FREE
App → Cloud (Data Preservation, Fraud deterrent)	FREE	FREE	FREE
In-app view of data	Order PDF	Included	Included with any subscription
Customizable Push Alerts for Flags/Loss Indicators Cloud Analytics PDF. "Summary / Exception" Report *includes static or dynamic PDF	N/A	$50 US per Scan in which Crash Data Records are Retrieved & Cloud Analyzed *price negotiable based on scale *typically flags represent 5-10% of claims *flags customizable for fraud, liability	N/A
Same as above (Structured Data): Push Alerts for Flags/Loss Indicators. Cloud	N/A	N/A	$50 per Scan in which Crash Data Records are Retrieved & Cloud Analyzed

Analytics by CS 			Ex. 50% of 200k claims * $50 = $5M *price negotiable based on scale *typically flags represent 5-10% of claims *flags are customizable for fraud and/or liability indicators like speeding or lack of a worn seat belt
PDF CS "Claims" Report  *available to access from within mobile app, cloud platform, AND via api so its available in claim file	$475 US per report *Bosch CDR file generated in lab upon request	$300 US per report Ex. 1% of 600k claims * $300 = $1.8M. Ex. 10% of 200k claims * $300 = $6M *price negotiable based on scale	N/A
Structured "Claims" Report Data 	N/A	Included	*included with PDF "Claims" Report subscription, same pricing
Structured Severity & Context Data Only (Delta-v, Impact Angle)	N/A	Included	*for partners like CARFAX

			
AI for repair estimate validation. **Powered in part by Audatex Estimatics and/or Claim Genius*	Included	Included	In development
AI for injury severity validation (from whiplash to Bodily Injury epidemiology)	Included	Included	Included
3rd Party Add- ons: **AI for repair estimate validation.** **Powered in part by Audatex Estimatics and/or Claim Genius* **Vehicle History:** Title & US accident History (NMVTS), like CARFAX data, *Powered by VinAudit* **Xtract Visualization** Google map reconstruction of pre-crash data			*price negotiable based on scale $40 per use *subscription pricing available $5 per use $40 per use *subscription pricing available

ON-DEMAND LAB SERVICES	Turnaround 1-2 hours
Evidence Logistics Order Platform Lab Processing of Modules via an Automated Shipping Label	$475 US

and Evidence Chain of Custody Tracking Form System	
Convert App-collected Cloud Crash Data → Bosch CDR PDF (via Car simulator in Lab) *for any scans using the CrashScan mobile app, upon request, we can replay the data into the Bosch or Hyundai tool to generate the Bosch CDR PDF	$475 US, included with on-demand pricing
Convert Bosch CDR PDF hex data → CS "Claims" Report *if provided the Bosch CDR PDF, we can format the hex data to be replayed through our application to generate our custom Claims Report. We are working on a potential user interface to streamline this process.	$475 US

COLLISION SCIENCES KIT

Collision Sciences can source, assemble and setup the Crash Data Kits for an inclusive fee of $300 USD per kit, which would be inclusive of the below list contents: OBD Adapter, OBD Extender (1-ft), 7-inch Tablet and protective case, and a Carrying Case. The fee would be inclusive of tablet setup and app download. Tablets can be setup as a "kiosk" single-use app device.

COLLISION SCIENCES INC.

STRATEGIC BUSINESS PROPOSAL

A COST-BENEFIT ANALYSIS OF CRASH DATA RETRIEVAL, ANALYSIS & REPORTING SOLUTIONS FOR PASSENGER VEHICLE EVENT DATA RECORDERS (EDRS)

As presented by
Chad Zinn

Foreword by
Jason Bayley

Research by
Brian Hsu

Strategic Business Proposal

PROVIDING DATA-DRIVEN INTELLIGENCE AT SCALE

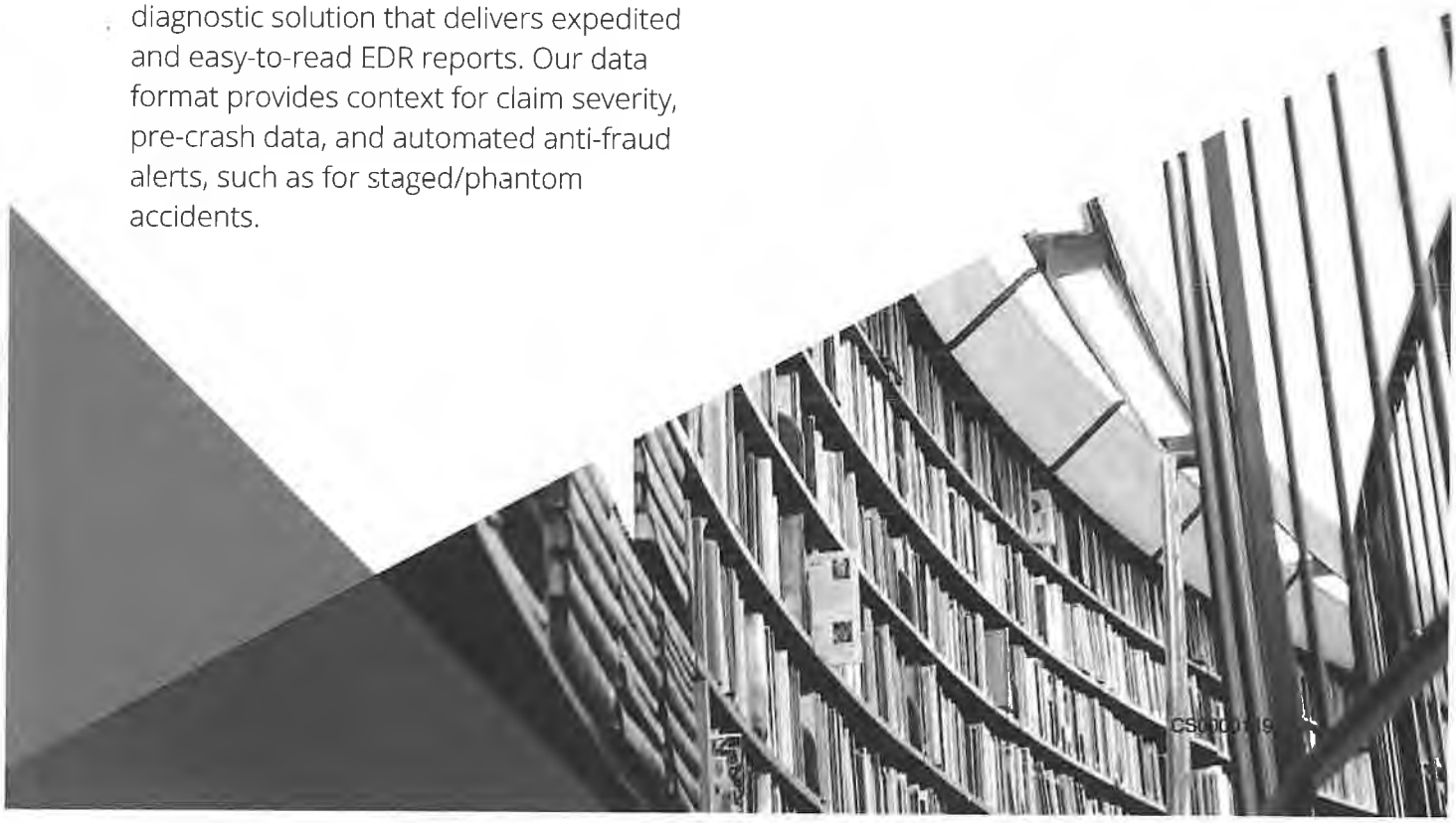
The engineering team at Collision Sciences spent three years researching and developing an industry changing product that enables scaled and intelligent access to vehicle black box data. By empowering insurance companies with routine anti-fraud and liability evidence, we are helping to significantly reduce overall claim/investigation costs and inefficiencies.

With our proprietary CrashScan app and On-Board Diagnostic (OBD) adapter in the hands of field appraisers, DRPs and SIU teams, we facilitate proactive preservation and cloud data analysis for all supported vehicles (75% and growing).

Our tech is the world's first cloud-based diagnostic solution that delivers expedited and easy-to-read EDR reports. Our data format provides context for claim severity, pre-crash data, and automated anti-fraud alerts, such as for staged/phantom accidents.

The data provides a means to deter, detect, deny and prosecute auto claim fraud, providing referrals and evidence for SIU fraud investigations. The data and reports can be used to verify claimant credibility or discredit statements, validate repair and injury severity claims, and also assist with liability or tort claims by providing evidence for fault determination.

Collision Sciences has developed strong partnerships with multi-national data providers and integration partners to scale and deliver its solution globally.



1 (877) 363-1996
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Collision Sciences

A Cost-Benefit Analysis of Crash Data Retrieval, Analysis & Reporting Solutions for passenger vehicle Event Data Recorders (EDRs)

1.0 Extracting Maximum Value from Black Box Data & Solutions

Introduction

Collision Sciences provides the world's first and only "blackbox to cloud" technology, enabling the ingestion of EDR data that can support many insurance-related functions; most notably for enhanced fraud intelligence and Claims handling. This cost-benefit analysis explores the various approaches to acquiring and utilizing EDR data. We encourage the reader not to consider the Collision Sciences solution as a direct comparison to the Bosch CDR tool, since many of the financial and operation benefits of using the Collision Sciences solution will be missed. However, for the purposes of this proposal, a financial comparison has been included.

CSI Solution Overview

The Collision Sciences solution comprises of an affordable Bluetooth OBD adapter and mobile app (CrashScan), which is given to SIU, damage appraisers, field adjusters and collision repair shops. The solution retrieves stored information from the EDR and transmits it to the cloud, where it is analyzed, aggregated with additional incident and reconstruction data, from which case reports can be downloaded and studied. Insurers can compare the data with what is being communicated by the involved parties, providing key indicators for fraud, severity, settlement decisions, and underwriting, where the data will also be used in data analytics to automate certain insurance processes.

2-minute video: CSI Field Demo (https://www.youtube.com/watch?v=NIbxGf7IPWw).

1 (877) 363-1996
www.collision-sciences.com

Collision Sciences

Executive Summary

The Collision Sciences solution was developed by a team of professional engineers, automotive experts and accident reconstruction professionals who have used the Bosch CDR system, having interpreted the EDR data over the last 15 years. The Collision Sciences EDR solution was developed to enhance the overall insurer and end-user experience in every possible way.

Collision Sciences provides a very affordable cloud-connected hardware kit that enables inexpensive distribution of equipment for crash data collection, analysis and reporting at scale. Data collection and analysis at scale provides a means for a new factual fraud intelligence data source. And, Collision Sciences provides more than just a cloud-enabled Crash Data Retrieval Kit; in fact it provides 3 EDR kits built into one by including Hyundai & Kia support as well (support which is not included in the Bosch CDR tool), while also providing significant human resource benefits by minimizing the need for training and time for analysis and reporting, through its user friendly data collection solution, data contextualization and easy-to-read PDF reports. Data collection is recommended through the first vehicle touch point, such as field appraisers, adjusters, and repair shops, to proactively preserve data early in the claim; and of course via SIU as needed.

> *"The big picture is that crash data can be preserved for every accident for free, where an affordable on-demand Recon/Bio report is available to a desk adjuster at the click of a button from within the claims system" - Jason Bayley, CEO & Founder*

Traditionally, insurers have relied on outside experts, due to the cost and complexity of Event Data Recorder (EDR) systems and their respective expertise required for data interpretation and reporting. Ongoing training is commonplace since the interpretation of the extracted EDR information is technically challenging and time consuming to summarize in report form (see details that follow). Some insurers have opted to train a few dedicated personnel for EDR retrieval; however, this option does not solve the logistical issues with collecting data following any accident, negating any meaningful or cost-effective fraud intelligence opportunity. The Collision Sciences solution enables both data collection at scale, with the added benefit of cloud-enabled "big data", and with a 10x reduction in cost for a report, when compared to hiring an outside expert.

This cost-benefit analysis will also show that the Collision Sciences solution provides significant value to an insurer, and its SIU and Claims teams, even if Bosch CDR kits have already been purchased and continue to be used. Collision Sciences can even provide a contextualizing EDR "Claims" report if provided a Bosch CDR report, which has been providing savings through

a significant amount of human resource time saved by experts and EDR users through case triage and in preparing a summary Recon/Bio report.

The Collision Sciences solution can facilitate immense savings for an insurer if utilized at scale, from a claims efficiency, settlement resolution and fraud management perspective. Even as a direct replacement for the Bosch tool for **10 users**, the upfront cost of the Collision Sciences solution is approximately $93,500 cheaper upfront, and estimated to be $415,500 cheaper per year (at a service level of 3500 recon reports), when considering the true human resource costs involved with proper data analysis and reporting. Note that 3500 Recon/Bio reports at an average cost of $3000/report would cost $10.5 million (about 10x more).

To directly compare and assess the value of an EDR data retrieval implementation, Bosch CDR versus Collision Sciences, a Cost-Benefit analysis must consider the following important factors:

- Personnel / Human Resource cost with extracting meaning from the data
- Fixed upfront hardware and training costs
- Ongoing software license costs
- Ongoing training / education costs

2.0 Collision Sciences: Value-based Business Models

With Collision Sciences technology, stakeholders may now proactively preserve EDR Recon data and purchase Claims Reports strategically, where direct ROI is expected. For example, if the insurer preserved data for 10,000 claims and purchased reports for only 1000 of those specific vehicle scans, the average cost would be $30 per vehicle scan. Where the alternative, if an insurer wanted to preserve EDR data for 10,000 vehicles using outside engineers, it might cost about $15-$30 million (@$1500-$3000 per service). Collision Sciences is immediately 10x more affordable than outside experts (@$300/report), and if used strategically, CSI could easily be a million times cheaper, literally.

Implementation:

Collision Sciences recommends equipping field personnel beyond the SIU, such as field appraisers or adjusters (as well as Direct Repair Providers (DRPs)) where significantly more data can be collected, preserved, and/or cloud analyzed; thus providing a new intelligent data source for SIU and Claims teams. For a DRP implementation, we recommend that insurers request that the 2-minute scan be performed as part of the $90 pre-scan, as an "independent pre-scan". The Collision Sciences solution also includes the capture of "enhanced diagnostics"

comparable to $1000 repair shop tools, and can provide an insurer proof that the pre/post scans were actually performed by a repair shop, providing liability assurance.

Collision Sciences Solution vs Hiring Outside Engineer

Typically expert engineers charge $225 per hour, costing insurers up to $5000 for a field visit and a written "Reconstruction Report". Organizations using the CS solution see value through a 10x reduction in the costs of preserving crash data and an acquiring meaningful report, when compared to an outside expert. Preserve data at the outset of the claim before the vehicle is repaired or scrapped. Example use case: tort claim filed up to 2 years after an accident.

Business Model

With the CS Solution, an insurer can preserve maximal crash data to the cloud for free after a one-time affordable purchase of an EDR kit. Access Collision Sciences "Claims" reports as-needed for 1/10th of the cost of an expert. Example cost: $300/report with subscription (negotiable at scale), or $475 for direct to module lab retrieval. Subscriptions include PDF Reports and access to the structured data via APIs.

Value

This model provides $1000- $2000 value per vehicle scan (via data preservation) and approximately thousands more in savings if purchasing an EDR Claims report on-demand, when comparing to the costs of an outside expert. Accessing a Collision Sciences "Claims" reports as-needed for 1/10th of the cost of an expert provides incredible value.

Collision Sciences Solution vs Bosch CDR Tool (Hardware Costs)

For the same cost of equipping just one in-house dedicated EDR person with all 3 EDR kits (Bosch CDR, Hyundai and Kia), which cost approximately $20,000, instead, 133x more personnel could be equipped with Collision Sciences kits (at $150 per basic Collision Sciences kit). Thus, where one in-house SIU user could accomplish approx. 50 - 200 scans per year, by instead equipping appraisers, adjusters and DRPs (body shops), there is potential to proactively reach all post-collision vehicles, providing a greater opportunity to preserve crucial data and flag fraud.

Fraud Intelligence (or Big Data) Program

Beyond the value in simply preservation of data for the "Claims" PDF Report generation, the insurer can subscribe to have the cloud data analyzed through algorithms and have customized alerts pushed directly to their internal system. For example, an insurer may request that following each scan, the insurer will receive Collision Sciences derived alerts, a 1-page PDF "Exception/Summary" Report, and the related raw structured data for their system. From a fraud intelligence perspective, the raw data can be used to generate new SIU referrals,

cross-reference known reported circumstances, create new scoring rules, reduce false positives from current rules, judge referral acceptance, and more.

How does the Collision Sciences solution provide value to Bosch EDR users?

The Collision Sciences hardware and software solutions could be a replacement for the Bosch CDR tool, but also could be used as a complementary tool. The CS solution provides value to an organization whether or not they already have invested in the Bosch CDR tool(s) for any number of users. Accident Recon experts are using our tool to compliment their in-house solutions and to save time on case triage and contextualizing the information. For example, the CS tool would provide the following features and benefits to an insurer already equipped with the Bosch CDR tools:

- Adds Hyundai and Kia support, valued at $13,000 and $2000/year alone. Even if the decision is made to equip every SIU or field appraiser with a Bosch kit, there is still a highly viable business case for equipping all SIU members with the CS tool to have access to the Hyundai/Kia crash data on-demand as well.
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- Use of the CS tool preserves data to the cloud, providing the option of big data for analytics and optional SIU referrals
- Preserving data to the cloud reduces risk of data loss and evidence spoliation by using built-in evidence chain of custody best practices
- SIU user would have a backup Crash Data Tool if the Bosch CDR does not work, which through field testing has been seen on various vehicles, Ex. Dodge Caravan and other random vehicles
- The current limitations of the CS solution are that an internet connection is required (such as tethered from a nearby wifi network or mobile device). And while the CS solution provides 10% greater "on the road support", a few select vehicle makes/models supported by Bosch are not supported by the CS tool (Ex. Volvo, Fiat). Where data retrieval is imperative, as a compliment to the CS tool, a Bosch CDR Tool or outside expert can be used.
- The CS Tool actually incorporates the main Bosch "pin changer" adapter. The adapter is required for the majority of vehicles (Ex. the many MS-CAN Ford vehicles and others).
- The CS solution is much more user friendly in the field; for example: where a user may think the Bosch tool is not functioning and fail to retrieve data, since the VIN can and must be retrieved from the vehicle before the adapter is used (with no warning messages), with the CS tool, the data is collected automatically. The Bosch CDR tool

can be very cumbersome, requiring a laptop, field training, constant software upgrades and other Bosch software bugs are known.
- Collision Sciences is committed to invest in technology improvement; further increasing vehicle support through continuing to add support that the Bosch tool does not cover; for Subaru, Land Rover/Jaguar, and Mitsubishi.

3.0 The Value of Data in the Claims Process

The Collision Sciences technology enables insurance carriers significant financial and operational benefits.

Using Accident Data in Claims

The use of accident data in claims (and at scale) is not a new notion. Many insurers have experienced significant savings across a wide spectrum of use cases through the use of telematics accident data in claims handling.

As an unbiased reference, please refer to the recently published Zurich/IMS study which presents quite similar value propositions to the CSI solution. For example, Zurich recognized the following use cases and savings:

- Reduced costs of getting accident data directly from the impact management system rather than from a third party: 60% (Note that CSI offers a 90% reduction in costs)
- Annual average claims savings for fleet operations, **based on 1,000 vehicles**. USD $370,000
- Insurer savings on pre-litigation and supported litigation cases using telematics data, **per case**. USD $6000 – $437,000
- Personal injury savings for fleet operations. USD $143,000
- Vehicle not at alleged collision location. USD $99,300
- Split liability cases. USD $127,000

The CSI solution enables the capture of quantifiable severity, which provides an actionable insight on the path of a claim.

State of Insurance Fraud

Insurance industry estimates generally put fraud at about 10% of the property/casualty insurance industry's incurred losses and loss adjustment expenses each year. Surveys by the Coalition Against Insurance Fraud have shown that Insurers have experienced a 20% to 50% reduction in fraud loss through implementing new technology. Further, studies of new fraud

technology implementations indicate insurers have experienced a 5-6 times ROI for spend, as well as a 50% increase in fraud detection. Measurable outcomes may include: claimant withdrawing an application, ceasing communication, or failing to submit documentation.

Implementing Collision Sciences solutions provides insurers the opportunity to deter, detect and prosecute the 10% of claims that are estimated to be fraudulent.

More Data, Earlier

Research has shown that the use of data, especially early on, has significant impact at all levels. While many property and casualty (P&C) carriers have incorporated data and analytics into their application and underwriting processes, few have integrated data deeply into their claims process.

To assess the effect of having more data earlier in the claims process, LexisNexis® conducted a study of more than 10 million features from A.M. Best's top 20 carriers. The results showed that having more data, earlier, had considerable benefits to claims outcomes. For third-party bodily injury settlements, the study found that more data earlier resulted in:

- 15–25 percent lower severity payments
- 25–49 percent lower attorney involvement
- 5–15 percent shorter cycle times

Similar results were obtained for third-party property damage claims:

- 10–15 percent lower severity payments
- 8–15 percent shorter cycle times

The impact of telematics data on claims outcomes is well documented. In the report by OCTO Telematics "Optimizing Claim Organizations' Financial Results Through Telematics", the following findings were presented. Insurers have claimed:

- 30% reduction in indemnity costs
- 14% reduction in time to settle claims
- 20% reduction in claims frequency, and
- up to 80% reduction in fraud.

The Collision Sciences technology will help the claims process to evolve from its current state to enhanced crash notification, superior fraud detection, touchless claims, and eventually to proactive claims mitigation.

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Enterprise Value of the Collision Sciences Solution

Today factual evidence is available, where in the past it was difficult to obtain. Historically, collision evidence has been based primarily on objective opinions; statements with varied views, creating a significant cost for claims handling. In most cases, the settlement was determined based on perceived credibility and severity.

CSI provides the opportunity for an integrated Enterprise approach for loss investigation using crash reconstruction data and reporting. The certainty of data, including loss indicators, directs claims handlers to exceptions and outliers requiring focused attention. The benefits are many and the following list is not exhaustive:

1. Reduced cycle time
2. Improved customer service
3. Loss Control Management
4. Expense Management
5. Improved profitability

With Collision Sciences technology, stakeholders may now proactively preserve EDR Recon data and purchase Claims Reports strategically, where direct ROI is expected. For example, if the insurer preserved data for 10,000 claims and purchased reports for only 1000 of those specific vehicle scans, the average cost would be $30 per vehicle scan. Where the alternative, if an insurer wanted to preserve EDR data for 10,000 vehicles using outside engineers, it might cost about $15-$30 million (@$1500-$3000 per service).

Collision Sciences is immediately 10x more affordable than outside experts (@$300/report), and if used strategically, CSI could easily be a million times cheaper, literally.

Cost avoidance for data acquisition is only the first financial benefit - the broad advantage of the CSI solution is for improving bottom line profitability. Beyond fraud intelligence, use in liability claims, BI and general claim handling are exploitable use cases for accident claims. As evidenced in other industry studies, CSI is tracking results that save $2000 to $3000 per long tail (tort-type) and questionable LVI (low velocity impact) type claims, by reducing the following costs: reduction of loss payment, reduction of expense payment (legal, outside investigation), reduction of claims administration (ULAE) and reduction of IBNR.

Collision Sciences retained the independent company LCM Solutions (Loss Control Management Solutions) to create a "profitability calculator" to develop our savings estimates. Collision Sciences aims to save insurers $3 million for every 1000 reports purchased, an ROI of

10x. Some insurers have experienced an ROI of up to 100x upon application of the CSI solution.

LCM Analysis: CSI Enterprise Value

LCM has developed a *Projected Savings Calculator,* with customizable inputs and assumptions. An insurer's specific savings may be revised based on changing assumptions and inputting paid claim experience into the CSI calculator. The calculator considers a vast number of use cases, and applies these use cases each to a very conservative number of claims, by claim type.

Savings Assumptions:

Average paid claims for specific kind of losses (modeled from the IBC 2018 Stats)

Metrics Considered

The table below notes the metrics considered in valuing the CSI experience based on claim types. The *Projected Savings Calculator* will allow the underwriter to use their own data to determine the ROI in applying and integrating the data.

Staffing Resources / Admin	Supply Chain	Fraud	Anticipated Injury Severity	Contributory Negligence
Expense Reduction	Subrogation	Cycle Time	IBNR (Incurred but not reported)	DC-PD (Physical Damage Liability)

The CSI enterprise value is not purely focused on controlling loss costs. The adjudication of claims can be concluded faster, providing certainty to the underwriter and a more expedient experience for the customer. In addition to cost avoidance, underwriters may also choose to provide their customers with a diagnostic report (inclusive of safety recall, mechanical performance) on the insured vehicle.

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4.0 Comparison of EDR Retrieval / Reporting Solutions

Direct Comparison of Collision Sciences vs Bosch CDR Tool

Example Goal: 3500 Reports for SIU and National Claims teams

In the Scenario where the Collision Sciences solution is reduced to a direct comparison to the Bosch tool, based on cost to extract a specific number of reports, the findings show that the Collision Sciences solution not only provides better value, but also reduces the time to receive the information, and reduces the risks of analysts making mistakes. The upfront cost of the Collision Sciences solution is approximately $93,500 cheaper than Bosch CDR Tool for every 10 users, and expected to be $415,500 cheaper per year, when considering the true human resource costs involved.

Collision Sciences Subscription	**Bosch Tool, Training & Human Resources**
Upfront Costs of CS Tool For 10 SIU users @ $150 per kit = **$1,500** **Estimated Ongoing Costs** *Unlimited Data Preservation* *Ex. 100,000 downloads* - ***$0*** *Claims Reports* Ex. Service Level: 3500 claims / year) * ($300/report) = **$1,005,000** **Note that 3500 Recon/Bio reports at an average cost of $3000 would cost $10.5 million (at least 10x more). 100k* ***Added Benefit of CS Cloud-analysis (*non-direct comparison):*** *Fraud Intelligence*	**Upfront Costs of Bosch Tool & Training** Fixed costs: $7500 / kit * 10 users = $75,000 Initial Training: $425 / user + travel costs = $2000 / user = $20,000 Total: **$95,000** **Estimated Ongoing Costs** Bosch Annual License Fee: $1050 *10 = $1,050 Annual training / conferences: Avg $1000 / user /year Total Ongoing Fixed Costs: **$20,500 / year** **Estimated Human Capital Cost** *for Training / Report Review / Report Analysis / Written Summary / Ongoing review & analysis of Cash Data versus case circumstances:

Raw Data / Push Alerts / /Exception Reports	Per case: 10 hours @ $40 / hour = $400. Example: 3500 cases * $400 = $1.4M / year
Total: $1,500 upfront, $1,005,000 / year **3500 Recon/Bio reports at an average cost of $3000 would cost $10.5 million (10x more)*	**Estimated Total:** $95,000 upfront, $1,420,500 / year
Added Benefits of CS Solutions: • Hyundai/Kia vehicle support • Preserve more data proactively • Use data in AI • Analyze more accidents via cloud automation to flag more fraud/liability • New internal data source for predictive analytics, Actuarial or Underwriting data science	**Comparison:** • Does not include access to Hyundai & Kia vehicles. • No viable business option to expand program beyond SIU. Adding each Bosch kit is a high upfront, and ongoing expense.

Details/Justification for Human Resource Estimations

Insurers equipping SIU team members with the Bosch tool has long been a difficult decision. The human resource costs associated with training, data collection, interpretation, analysis and documentation in report form **must not be underestimated**. The detailed requirements and cloud performance of the Collision Sciences system are documented below. **Review the difference between the sample Bosch CDR Report and Collision Sciences Report to realize the value.** Also to consider, if equipping users with the Bosch system only, there is the further logistical and cost issue with either sharing or additionally training users on the Hyundai and Kia EDR tools; Hyundai and Kia making up a significant 10% of vehicle market share.

Typically accident reconstruction experts are tasked by insurers with retrieving and reporting on crash data findings. These professional experts perform the task about once or twice per week and attend annual training courses and conferences. A crash data analyst must become familiar with how to interpret crash data by OEM. The analyst must add or understand context, make notes and document that context in report format. And the analyst must be able to understand engineering terms and perform calculations to document its full meaningfulness. Once the basic interpretation is completed, further analysis against reported circumstances, as well as accident reconstruction and injury analysis is usually performed.

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The following is a detailed list of the complicated tasks that would generally be required when reviewing, analyzing, interpreting and extracting meaning from a typical Bosch CDR report.

***Spoiler Alert**: the listed tasks, calculations, contextualization, and explanations are automatically performed and displayed in the Collision Sciences "Claims" Report, thus saving insurers both time and money; where the turnaround time is also instant (as opposed to days waiting), and the cost associated with human resource allocation is nullified.*

A crash data analyst must learn to be proficient at the following (RE: Bosch CDR Reports):.

- Ordering multiple crash events (since events and their respective data are not well organized and are inconsistent by OEM/vehicle model). Ordering events requires:
    - Identifying ignition cycles for all recorded events (if available) and the ignition cycles at the time of data imaging (download/retrieval).
    - Calculating event recency, by using the ignition cycle data for each event and performing a subtraction calculation for ignition cycles at download minus the ignition cycles at event. For events with distinct ignition cycles, the analyst must treat as separate events (Most Recent, 1st Prior, 2nd Prior...etc). For events sharing ignition cycles, the analyst must determine event order by analyzing the 5.0 seconds of pre-crash data (checking for data overlap, such as common speeds, etc). An example ordering could be: Most Recent, 1st Prior (1st Impact), 1st Prior (2nd Impact), 2nd Prior, where the vehicle had 4 distinct crash records, with two of those belonging to the same group.
    - Lastly, linking crash events for rollover or side impact events (which are inconsistent by OEM and vehicle model) as well as linking pre-crash data to severity data (also inconsistent by OEM and vehicle model).
- Calculating and interpreting severity. Requires calculating resultant delta-v values, which requires an understanding of the difference between longitudinal and lateral acceleration, calculating the resulting vector components to get impact angle. It also requires the proficient use of positive and negative accelerations and understanding which are front/rear and left/right. This information is used to validate crash event data to actual visible damages to corroborate evidence. The analyst must then also understand the severity context. Example: how severe was a -24 km/h impact? Severity units also vary by OEM and vehicle model, for example: g-force or delta-v. Requires experience, research and technical knowledge to extract context and case applicability.
- Understanding how to interpret the information in the pre-crash data. For example, knowing that the brake or accelerator pedal is applied between time interval recordings, where speed, engine rpm and steering angle are recorded at specific intervals.
- Adding context to steering (left/right). Not all OEMs use the same left/right convention.
- Adding context to braking. The accelerator pedal (% applied) is provided by the Bosch CDR Report but it does not calculate the brake pedal %. The analyst must add context to braking. For example, they must use speed reductions to perform complex calculations to understand braking efficiency.

- Understanding the seatbelt and airbag sections (system status / status at crash) and that there are inconsistencies between OEMs (terminology, supported features/functions, etc). For example, the analyst must understand that a passenger's seat belt status indicating "not buckled" does not mean there was no passenger. It can be complicated and confusing to interpret the meaning in certain cases.
- The user must often carefully read the "data limitations" section to understand the implications of the specific vehicle's data. Often the training course notes must be referred to.
- Understanding the meaning of the various technical data sections, being careful not to misinterpret information
- Checking work for any possible miscalculations.
- Bosch Software also requires constant updates, i.e. human activity/resources.

In addition to extracting and organizing the EDR information, the Collision Sciences Report contextualizes the data and does the following (to name a few):

- Automatically analyzes the data and flags known fraud/liability issues.
- For the most recent event(s), predicts total loss or repairable condition. Uses the largest crash pulse component and predicts approximate repair estimates using a range of inputs, including market valuation APIs. If airbag deployment or rollover events are found, they are factored in the estimate as well.
- Determines the largest crash pulse component ever recorded in the most recent event(s) to use for occupant injury prediction. Estimates relative 3rd party injury risk based on largest crash pulse recorded on the 1st party vehicle and a conservation of momentum calculation.
- Has the ability to analyze against provided claims and reported data to provide more specific, automated accident reconstruction and injury causation reports

The human resource time-based costs are estimated in Table 1 (below) as taking up to 10 hours per file. We have attached for reference comparable Bosch CDR Reports and Collision Sciences "Claims" Reports to exhibit the difference.

Table 1: Comparison of EDR Retrieval / Reporting Solutions

	Collision Sciences Solution (Cost/Value)	Comparable Cost ($) - Traditional	Comparable Cost ($ and human resources)
Personnel	SIU or Appraisers: Ex. In-house personnel	Local Outside Expert	In-house insurance trained EDR personnel

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System Features	with Collision Sciences Solution	(Forensic Engineer)	Ex. SIU only
EDR Hardware / Software License - Only field Kit cost considered - Full direct to module kit is $15,000 US	$150 to $300 for a Kit (depending on tablet). No License Fee. Includes: Bluetooth OBD adapter, cable extender, 7" Android tablet, soft carrying case.		Bosch CDR Pro Tool + laptop ($7500 + $1050 / year license), Hyundai & Kia Tools ($13,000 + $1000 / yr license). Total: $20,000 + annual license fee ($2000 / year)
Data Preservation / Training	Easy to use and automated app. Training: 3 minute video. Automatic updates on server side	Travel and Inspection @ $220/hour, approx. fee: $1500 - $2000	Crash Data Group has a 4-hour online user training for field use of CDR tool: $150. *Software requires constant updates, i.e. human activity/resources.
On-site Data Review & Understanding of Data	Easy to Understand. Real-time data context and summary in-app No Training Required; but Pre-recorded on-demand webinars or in-person training and EDR certification available.	Comparable to verbal report from Engineer. Experts typically attend annual conferences and training.	Bosch has training course to help understand the PDF reports by OEM. 3-day insurance data application course for $450 (course in California Dec. 2018) Cost: 24 hours human capital + travel expenses). Estimated average staff training cost per user: $1000 / year
Basic "Easy to Read" EDR PDF Reports 	Cost: usage based & value-based pricing	Written Summary Report costs $2000 - $3000. Total cost incorporating field data collection: $4000 - $5000	Human review of EDR report, referring to course notes, conducting analysis and written summary of findings. *Estimated staff hours and turnaround for task: 4 hours.
All-inclusive PDF Report (Loss Predictions, Fraud Alerts, Recon, & Statistical Biomechanical Injury Information)	Automated $300 per report. Subscribe to service level required.	Comparable Expert Reconstruction & Bio Research Report costs: $8000 - $10,000.	Requires research & analysis, and ongoing human review of EDR data versus reported circumstances. *Estimated hours for task: 5 hours over

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			life of file.
Added value: Big Data - Internal Data Source	Automated		Would require data entry task and in-house custom software (like NHTSA). *Estimated hours for task: 1 hour.
Added Value: Big Data is analyzed in cloud to provide SIU referrals (additional alerts if given reported circumstances)	Automated		Requires ongoing human review of EDR Summary report, versus reported circumstances.
Cost Per Use & Comparable Value	**Turnaround Time:** Instant. **Total cost per use**: $300 per report (can be via API call for PDF) *no limit to data preservation/cloud storage *includes fraud intelligence program, big data for predictive analytics **Initial cost**: $150-300 per kit for any user (appraiser, adjuster, DRP etc).	**Turnaround Time:** 3-5 days. **Estimated Cost per use**: $4000 - $5000 **The Collision Sciences "Claims" Report provides the comparable value of an expert report costing:** $8000 - $10000	**Turnaround Time:** 1-2 days. **Estimated cost per use for SIU:** Year 1: $680 (Bosch kit only), $860 (if including Hyundai/Kia) Year 2 and on: $460 *assumes user does 50 CDR downloads / year and $40/hr for the estimated annual costs of $23,000 **Initial cost**: $11,020 for just Bosch Field Kit + training (or $20,000 with Hyundai/Kia kits) *data collection limited to SIU use, risk of mistakes

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5.0 Collision Sciences Report Types & Use Cases

Basic Claims Report (available for 100% of vehicles scanned)

Data Included:

- Vehicle Health Diagnostics, Enhanced Vehicle Diagnostics (where applicable), Freeze Frame Data, E-test Failure Flags
- Diagnostic Safety Codes (Brakes, Tires, Steering etc.)
- DTC-based Repair Cost Details
- Recall Information & IIHS Safety Flags
- Market Value, Vehicle Specs
- Predictive Injury indicator report (severity based) using damaged photographs (in development)

Example Use Cases:

- Provide Report as value-add to customer (pre or post scan)
- Warranty, Safety and Recall related Claims
- Internal investigation, Fraud flags (Ex. purposeful write-off due to diagnostic issues)
- Data to validate Supplemental Repairs and associated Costs (operational efficiency)
- Diagnostic Data Information for Collision Repair Owners

EDR Claims Report (available for ~75-80% of vehicles scanned)

Two report types:

a. Full EDR Data (~80% of Reports)
b. Minimum Severity / Limited Data Report (~20% of Reports)

Data included:

In addition to the Basic Claims Report data:

a. Full EDR Data (~80% of Reports)
   - Crash Records List (6 data points per record) including severity context, Pre-impact speed range and impact speed (3 data points)

- Pre-Crash Data Reconstruction Data Sets (55 to 75 Data Points per record - potential for 20 seconds of pre-crash data, 300 data points on driver speed, brake/accelerator pedal use, steering)
- Seatbelt Use & Airbag Deployment Status
- 1st & 3rd Party Statistical Injury Risk Analysis (Biomechanical Report)
- Fraud Flags (including pre-crash data analysis, and cross-references reported circumstances)
- Liability Flags (driver speeding, distracted driver)
- Total Loss Prediction (in development)

Example Use Cases:

- Detect Outright Fraudulent Claims; using Pre-crash Data Fraud flags (Staged Accidents, Unrelated Accident Damage), opportunity to automate cross-referencing to claims data as represented
- Detect Soft/Opportunistic Fraud, including exaggerated injury claims (data includes severity-based Injury Risk from minor to severe collisions)
- Opportunity to direct resources more effectively, including SIU resources and outside expert or PI resources
- Opportunity to settle typical claims more quickly, resolve disputes, such as on 50/50 liability decisions
- Liability Claims – defend liability, or settle quickly where exposed
- Contributory Negligence (reduce claim payouts for liable driver's (speeding, unbuckled), or front passengers in 3rd Party Liability Claims
- Underwriting – flags for moral hazards, potential distracted drivers
- Strategic Opportunity to use data for predictive analytics, such as probable liability, reserve/settlement amounts

b. Minimum Severity / Limited Data Report:

- Suggests very minor acceleration/vehicle movement, vehicle stopped. Expectation of injury exposure minimal (potential to direct SIU resources more effectively)

Example Use Cases:

- Potential Soft/Hard Fraudulent Injury Claims
- Hit & Run Claims (potential vehicle actually recording crash event)

Customizable Options:

- Exception Reports, Management Reports & APIs

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Appendix A: Subscription Licensing & Professional Fees

USAGE-BASED SUBSCRIPTION **Report Pricing and Plan Details.**	
Report Fees	Fee of $300 USD per Claims Report (EDR supported vehicles). Fee of $50 USD per Vehicle Health Report (for non-EDR vehicles, applies to any vehicle after 1996). *Fee only applies once per VIN (or per unique report) and only for reports downloaded, viewed, or where a user is subscribed (Ex. field investigator).
Vehicle Scans (Data Preservation)	$0 per Vehicle Scan. Enables and promotes proactive data collection and preservation (Ex. repair shops, damage appraisers). Alternate "Restricted Access" mobile application login(s) can be provided to segregate "subscription" users (full report access) from "preservation" users.
Hardware	OBDLink MX+ Bluetooth Adapters can be purchased as required per On-boarding Document (self-service hardware purchase information). Collision Sciences can arrange for hardware (10% service coordination fee applied), and/or setup custom tablet kits with carrying cases.
APIs (Data Science)	No fee for EDR Supported API. Fee per API call for strategic "Exception" checks on preserved data (Fraud/Liability Intelligence Program) where a Report purchase is triggered if conditions are met. *Raw (structured) data API access for all paid Claims Reports.
Customization	Customization of Reports (Claims Reports, Exception Reports, Management Reports, Big Data Reports, Admin Dashboards).

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	Ex. customize report content (Recommended Actions) *Customization may require a SOW depending on scope and requirements.
Fee Schedule (Package Discounts)	Invoices, including fee breakdown of ad-hoc report and API usage provided to billing contact on the 1st of every month. Payment by EFT expected within 30 days. Package Discounts: 1000 reports (5%), 5000 reports (10%), where the discount increases by 5% for each 5000 reports (up to a discount of 50%). Package fee paid quarterly, with first 25% of package fee due prior to start date. Overage report fees at package rate, reconciled at year end.
Technical Support	Technical Support provided per the SLA. *Professional consultation on data interpretation related to case details provided at $4/min.

HARDWARE **Information and options for hardware.**	
EDR Diagnostic Kit  	**Cost: $150 USD** The prepared $150 Kit includes the OBDLink, a cable extender and soft carrying case. An optional $300 Kit includes: • Tablet 7-inch, *must tether internet from mobile phone Protective case • Hard-shell Carrying Case (optional)

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Appendix B: Sample Claims Report & Bosch CDR Report

Collision Sciences ***CLAIMS REPORT***

EXPOSURE, RISK & DECISION SUPPORT

Vehicle: 2018 Volkswagen Golf GTI

VIN: WVWZZZAUZJW******

Report Number: OM-00008

Generated: 2019-05-16 19:53:53

REPORT SUMMARY

This section provides an overview of the predictive analytics used for the estimation of claim severity, exposure, and fraud risk for the most recent crash or event sequence.

Repair / Loss Exposure	N/A
Occupant Injury Risk	1st Party - Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks): 21% (Possible). Risk of Serious Injury: 30% (Possible) 3rd Party (if any; for average car size) - Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks): 100% (Almost Certain). Statistical Likelihood of Moderate Injury (lasting 5 to 6 months): 100% (Almost Certain). Risk of Serious Injury: 30% (Possible)
Pre-Crash Vehicle Speed	Within the 5.0 seconds of recorded pre-impact data for the most recent crash, the recorded speed range on this vehicle was **70 km/h** to **156 km/h**. The vehicle speed was **70 km/h** at the moment of impact.
Flags / Loss Indicators	Medium Risk (2 Alerts): Pre-Damaged Vehicle (Front), Unbuckled Passenger
Diagnostic Scan Results	No Issues Found
Safety Issues / Ratings	No Recalls Found. No Safety Ratings Alerts Found. Structural/Frame Damage. Even minor damage, if not repaired properly, can seriously degrade a car's ability to protect you in an accident.
Recommended Action / Notes	Expedite Settlement / Treatment. Compare pre-crash data to reported circumstances. **Evidence of Dangerous Operation / Criminal Negligence**.

CRASH DATA RECORDS

This section lists crash data records stored on the vehicle's event data recorder. The date of crash data collection was 2019-05-16.

Recency / Sequence	Crash Severity	Type / Damage Area	Sudden Speed Change	Force of Impact (g-Force)	Direction of Force	Engine Starts Since Event
Most Recent (1st Impact)	Moderate	Right Front. Roll Motion.	-44.00 km/h (Decreasing)	31.15 g	27 degrees (1 o'Clock)	5
Most Recent (2nd Impact)	Moderate	Right. Roll Motion.	-8.00 km/h (Increasing)	5.66 g	104 degrees (3 o'Clock)	5
Most Recent (3rd Impact)	Moderate	Right Front. Roll Motion.	-2.00 km/h (Decreasing)	2.83 g	27 degrees (1 o'Clock)	5
Most Recent (4th Impact)	Moderate	Front. Roll Motion.	-5.00 km/h (Decreasing)	2.83 g	349 degrees (12 o'Clock)	5
1st Prior	Moderate	Roll Motion	1280.00 deg (N/A)	N/A	N/A	54
2nd Prior	Moderate	Front. Roll Motion.	-1.00 km/h (Decreasing)	2.83 g	0 degrees (12 o'Clock)	155

How To Interpret This Information

The crash severity (acceleration / g-force) measured by the airbag module accelerometer reached a maximum value of 44.00 km/h within 230 milliseconds, which is considered "severe" in terms of severity. Damage occurred on the left side of the vehicle. The vehicle's ignition was turned on 5 times between the incident and crash data download; this number can be used as an indication of event recency. For example, if the vehicle were used an average of 2 times per day, the recorded collision event would have occurred approximately 2 days prior to the the date of retrieval on 2019-05-16.

Crash events are sorted and displayed in order of recency. It is possible for an airbag module to contain multiple records for a single event. In that case, event recency will be further marked by "1st Impact", "2nd Impact"...etc., with "1st Impact" being the initial record in sequence.

PRE-CRASH DATA / Most Recent (1st Impact)

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	156	4416	0.0	Off	N/A	0 (Straight)
-4.5	162.4	154	4416	0.0	Off	-0.1 (Light)	0 (Straight)
-4.0	141.1	152	4352	0.0	Off	-0.1 (Light)	0 (Straight)
-3.5	120.1	150	4288	0.0	Off	-0.1 (Light)	0 (Straight)
-3.0	99.5	147	4160	0.0	On	-0.2 (Light)	0 (Straight)
-2.5	79.6	140	3968	0.0	On	-0.4 (Moderate)	0 (Straight)
-2.0	60.6	134	3456	0.0	On	-0.3 (Moderate)	0 (Straight)
-1.5	42.4	128	2880	0.0	On	-0.3 (Moderate)	0 (Straight)
-1.0	25.5	115	2496	0.0	On	-0.7 (Hard)	12 (Left)
-0.5	11.2	91	2112	0.0	On	-1.4 (Emergency)	20 (Left)

0.0	0.0	70	1600	0.0	On	-1.2 (Emergency)	198 (Left)

PRE-CRASH DATA / Most Recent (2nd Impact)

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	156	4416	0.0	Off	N/A	0 (Straight)
-4.5	162.4	154	4416	0.0	Off	-0.1 (Light)	0 (Straight)
-4.0	141.1	152	4352	0.0	Off	-0.1 (Light)	0 (Straight)
-3.5	120.1	150	4288	0.0	Off	-0.1 (Light)	0 (Straight)
-3.0	99.5	147	4160	0.0	On	-0.2 (Light)	0 (Straight)
-2.5	79.6	140	3968	0.0	On	-0.4 (Moderate)	0 (Straight)
-2.0	60.6	134	3456	0.0	On	-0.3 (Moderate)	0 (Straight)
-1.5	42.4	128	2880	0.0	On	-0.3 (Moderate)	0 (Straight)
-1.0	25.5	115	2496	0.0	On	-0.7 (Hard)	12 (Left)
-0.5	11.2	91	2112	0.0	On	-1.4 (Emergency)	20 (Left)
0.0	0.0	70	1600	0.0	On	-1.2 (Emergency)	198 (Left)

PRE-CRASH DATA / Most Recent (3rd Impact)

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	154	4416	0.0	Off	N/A	0 (Straight)
-4.5	146.9	152	4352	0.0	Off	-0.1 (Light)	0 (Straight)
-4.0	125.9	150	4288	0.0	Off	-0.1 (Light)	0 (Straight)
-3.5	105.3	147	4160	0.0	On	-0.2 (Light)	0 (Straight)
-3.0	85.3	140	3968	0.0	On	-0.4 (Moderate)	0 (Straight)
-2.5	66.3	134	3456	0.0	On	-0.3 (Moderate)	0 (Straight)
-2.0	48.1	128	2880	0.0	On	-0.3 (Moderate)	0 (Straight)

-1.5	31.2	115	2496	0.0	On	-0.7 (Hard)	12 (Left)
-1.0	16.9	91	2112	0.0	On	-1.4 (Emergency)	20 (Left)
-0.5	5.8	70	1600	0.0	On	-1.2 (Emergency)	198 (Left)
0.0	0.0	13	448	0.0	On	-3.2 (Emergency)	94 (Left)

PRE-CRASH DATA / Most Recent (4th Impact)

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	150	4288	0.0	Off	N/A	0 (Straight)
-4.5	108.1	147	4160	0.0	On	-0.2 (Light)	0 (Straight)
-4.0	88.1	140	3968	0.0	On	-0.4 (Moderate)	0 (Straight)
-3.5	69.1	134	3456	0.0	On	-0.3 (Moderate)	0 (Straight)
-3.0	50.9	128	2880	0.0	On	-0.3 (Moderate)	0 (Straight)
-2.5	34.0	115	2496	0.0	On	-0.7 (Hard)	12 (Left)
-2.0	19.7	91	2112	0.0	On	-1.4 (Emergency)	20 (Left)
-1.5	8.5	70	1600	0.0	On	-1.2 (Emergency)	198 (Left)
-1.0	2.8	13	448	0.0	On	-3.2 (Emergency)	94 (Left)
-0.5	1.2	10	0	0.0	On	-0.2 (Light)	254 (Left)
0.0	0.0	7	0	0.0	On	-0.2 (Light)	254 (Left)

PRE-CRASH DATA / 1st Prior

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	68	1152	0.0	On	N/A	0 (Straight)
-4.5	66.5	66	1152	0.0	On	-0.1 (Light)	-2 (Straight)
-4.0	57.4	65	1088	0.0	On	-0.1 (Light)	-2 (Straight)
-3.5	48.5	64	1088	0.0	On	-0.1 (Light)	0 (Straight)

-3.0	39.7	62	1344	0.0	On	-0.1 (Light)	0 (Straight)
-2.5	31.3	59	1344	0.0	On	-0.2 (Light)	0 (Straight)
-2.0	23.5	54	1216	0.0	On	-0.3 (Light)	2 (Straight)
-1.5	16.4	48	1088	0.0	On	-0.3 (Moderate)	6 (Straight)
-1.0	9.9	45	1216	0.0	On	-0.2 (Light)	16 (Left)
-0.5	4.2	37	1024	0.0	On	-0.5 (Moderate)	24 (Left)
0.0	0.0	24	832	0.0	On	-0.7 (Hard)	36 (Left)

PRE-CRASH DATA / 2nd Prior

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	32	2368	42.0	Off	N/A	-40 (Right)
-4.5	47.0	35	2624	36.0	Off	N/A	-34 (Right)
-4.0	41.9	38	2752	20.0	Off	N/A	-26 (Right)
-3.5	36.7	38	2816	8.0	Off	0.0 (Light)	-24 (Right)
-3.0	31.4	38	2816	10.0	Off	0.0 (Light)	-18 (Right)
-2.5	26.1	38	2176	10.0	Off	0.0 (Light)	-16 (Right)
-2.0	20.8	39	1984	15.0	Off	N/A	-6 (Straight)
-1.5	15.3	39	1984	20.0	Off	0.0 (Light)	-6 (Straight)
-1.0	9.9	40	1984	0.0	Off	N/A	-10 (Straight)
-0.5	4.4	38	1856	0.0	On	-0.1 (Light)	-10 (Straight)
0.0	0.0	26	1216	0.0	On	-0.7 (Hard)	-10 (Straight)

How To Interpret This Information

Each pre-crash data set contains recorded vehicle operating status 5.0 seconds prior to impact. Accelerator Pedal, Brake Switch Status, and Steering Angle can be used to reconstruct the driver's maneuver leading up to the impact.

Deceleration (in g) is calculated using speed differences between data points. Note that deceleration depends heavily on road conditions. For example, in winter driving conditions, it may only be possible to reach a peak deceleration of 0.2g.

SEAT BELT & AIRBAG STATUS (Most Recent Crash)

This section lists the restraint system status at the time of the event recording, including airbag deployment status and the seatbelt buckle insertion status for supported seating positions.

CS0000175

Seating Position	Driver	Front Passenger
Occupant Classification	Occupied	Occupied
Safety Belt Status	Buckled	**Unbuckled**
Frontal Airbag	**Deployed**	**Deployed**
Side Seat Airbag	Not Deployed	Not Deployed
Side Curtain Airbag	Not Deployed	Not Deployed
Knee Airbag	Unavailable	Unavailable

FLAGS / LOSS INDICATORS

This section lists flags for further investigation based on known anti-fraud indicators and/or inconsistencies with reported circumstances.

Indicator	Description	Risk Alert
Drive Down	Frontal collision where the driver accelerates up to impact, with no pre-impact brake application.	No
No Avoidance Maneuver	No driver input for either brake or steering maneuver within the 2 seconds prior to impact.	No
Possible Distracted Driver	In a frontal collision, driver did not either brake or steer 2 seconds prior to impact.	No
No Pre-Impact Speed Reduction	Brake is only applied lightly with no meaningful reduction in speed.	No
Steered-To Sideswipe	Driver steers either left or right, causing an impact on the steered-to side.	No
Swoop & Squat	Driver steers to make a lane change and quickly applies brakes.	No
Panic Stop	Rear-end collision where driver brakes just prior to impact.	No
Past Posting	Accident recording may not be recent. Event data recorded 25 or more engine starts prior to data retrieval.	No
Possible Intentional Damage	Event data recorded on successive engine starts (sequential ignition cycles), or multiple events recorded on the same ignition cycle, where pre-crash data does not overlap.	No
Pre-Damaged Vehicle	Evidence of prior accident damage, where data of multiple events was recorded at different engine starts. Possible issues include: Unrelated Damage to Incident, staged Hit & Run, Phantom Accident, or Paper Accident.	**Yes**
Unbuckled Driver	Driver not wearing seat belt at the time of crash data recording.	No

Unbuckled Passenger	Front passenger not wearing seat belt at the time of crash data recording.	**Yes**
Emissions Test Failure	Vehicle failed emissions inspection due to insufficient sensor data or diagnostic trouble codes (DTCs).	No

Reported Circumstances

The flags in this section are generated through cross-referencing provided information (if any).

Indicator	Description	Diagnostic and Predictive Data	Reported Info
Reported Number of Occupants	Compares the reported number of occupants to the available seat sensor data.	2	N/A
Reported Maximum Pre-Impact Speed	Compares the reported travel speed with the pre-crash data and flags a variance of 10 km/h.	156	N/A
Reported Impact Speed	Compares the reported impact speed with the pre-crash data and flags a variance of 10 km/h.	70	N/A
Reported Pre-Impact Maneuver Variance	Compares the reported pre-impact motion with pre-crash data and impact angle for consistency.	Going left	N/A
Reported Appraisal Variance	Compares a provided appraisal estimate with the AI estimate and flags an appraisal variance of +15%.	679339	N/A
Reported Airbag Deployment Variance	Determines whether airbags were manually removed to exaggerate damage by comparing recorded airbag deployment status.	Deployed	N/A
VIN Mismatch	Compares the VIN diagnostically retrieved from the vehicle to the the VIN sticker or provided VIN. Requires claim reference number.	WVWZZZAUZJW******	N/A
Image Integrity	Utilizes algorithms to identify digitally edited or altered parts in provided photographs.	N/A	N/A
Pre-Accident Vehicle Sale Attempt	VIN identified in online classifieds within the last 6 months.	N/A	N/A

1ST PARTY / INJURY SEVERITY & DURATION

This section predicts occupant injury risk ranging from minor to moderate/serious injury for frontal/side/rear collisions. The injury risk is the statistical incidence, likelihood, and probability of injury as tracked in real-world crash studies using event data recorders. The model uses a regression model of crash severity versus reported injuries as published in scientific studies.

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks)	Statistical Likelihood of Moderate Injury (lasting 5 to 6 weeks)	Risk of Serious Injury

Occupants in Frontal Impact	21% (Possible)	11% (Unlikely)	30% (Possible)

How To Interpret This Information

Low Velocity Impact Studies

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with the risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010).

Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Hell et al., 2002) and Sweden (Krafft et al., 2005). In the minor severity studies it was found that occupant's reporting symptoms for greater than one month corresponded to an average delta-V of 12.4 +/-2.9 mph and a mean acceleration of 5.3 +/-0.6 g. Occupants that sustain soft tissue symptoms for less than one month, on average, corresponded to a delta-V of 6.4 +/-1.3 mph and a mean acceleration of 3.9 +/-0.5 g. The mean acceleration was found to be the best predictor for duration of symptoms.

The following studies describe the impact severity when no injury or only short-term consequences occur: Hell and Langwieder (1998) found that most occupants sustained short-term symptoms in impacts where the change of velocity was 10-15 km/h (6.2-9.3 mph). McConnell et al (1995) performed low-speed rear impacts with seven male volunteers, with velocity changes of up to 10.9 km/h (6.77 mph). None of the volunteers reported whiplash symptoms after a few days. Ono and Kaneoka (1997) and Siegmund et al (1997) found similar results from volunteer tests. In another study with volunteers (Eichberger et al 1996), where the sled impact velocities were 8-11 km/h (4.9-6.8 mph) and the mean deceleration 2.5 g, the volunteers suffered whiplash symptoms for approximately 24 hours.

Typical G-forces (Tolerance)

A hard acceleration or deceleration in a vehicle produces a sustained g-force in the range of 0.6 to 0.8 g. In everyday life, humans experience g-forces stronger than 1 g. The steep ascent of an Airbus A-300 would produce 1.8 g. A sneeze results in about 3 g of acceleration and typical cough produces a momentary force of 3.5 g. A luge athlete may experience forces of 5.2 g. Roller coasters are usually designed not to exceed 3 g but are known to reach 6.3 g. A slap on the back may produce a force of 4 g. Humans typically black out at 6 g, where fighter pilots where special "g-suits" to withstand forces up to 9 g. A car crash with forces of 10 g can break human bones. A belted occupant in a car crash at 30 g could sustain broken ribs when held by the seat belt. Humans can tolerate localized g-forces in the 100s of g's for a split second, such as a slap to the face. Sustained forces above about 10 g can be deadly or lead to permanent injury.

With a high risk of whiplash or other injury, the claim can be expedited. Early treatment is often effective in providing the best probable outcome for patient recovery.

The injury prediction is based on the actual incidence rate or proportion of injury in tracked studies using data from real-world outcomes. The most important factor in predicting the risk of injury or death in a vehicle crash is the crash severity, which is expressed as the velocity change, or Delta-V, experienced by the vehicle during the crash. The Crash Investigation Sampling System (CISS) is the largest database in the world with over 100,000 cases linking injury outcomes with Delta-Vs, which are obtained from field reconstructions. The effects of occupant age, gender, and belt use on injury and fatality risk have been found substantial.

RELATIVE INJURY RISK / 3RD PARTY EXPOSURE

This section provides a lead indicator for relative 3rd party injury risk based on accident reconstruction principles including conservation of momentum and relative vehicle mass (Delta V2 (Change in velocity) = Delta V1 * M1 / M2). The calculation does not require the vehicles reach a common post-impact velocity. Calculated injury risk applies only to the occupants in another passenger vehicle or light truck as shown and not to any struck pedestrian or cyclist (bicycle or motorcycle).

Assumed 3rd Party Vehicle	3rd Party Vehicle Delta-V / Severity	Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks)	Statistical Likelihood of Moderate Injury (lasting 5 to 6 weeks)	Risk of Serious Injury
Compact Car (1815 kg)	44.85 km/h	100% (Almost Certain)	100% (Almost Certain)	30% (Possible)
Midsize Car (2260 kg)	36.02 km/h	100% (Almost Certain)	100% (Almost Certain)	13% (Unlikely)
Van/SUV/Light Truck (2720 kg)	29.93 km/h	100% (Almost Certain)	100% (Almost Certain)	5% (Improbable)
Full Size Truck/SUV (3630 kg)	22.42 km/h	75% (Very Likely)	26% (Possible)	2% (Improbable)

POTENTIAL RECALLS / SAFETY / DIAGNOSTIC SCAN DATA

This section lists any potential outstanding recalls, known safety ratings & issues, retrieved DTCs (Diagnostic Trouble Codes), and respective Freeze Frame impact data, if any.

Potential Safety Recalls

Vehicle safety recall information is received from Transport Canada and includes all known recalls associated with this particular vehicle model. Any listed recalls are potential recalls which can be verified as outstanding or not by providing the VIN to a local dealer's service department.

No outstanding recalls were found associated with this VIN.

IIHS Crashworthiness / Safety Ratings

Insurance Institute for Highway Safety (IIHS) in the US publishes vehicle safety ratings based on actual crash tests. In each category, the possible ratings are: Good, Acceptable, Marginal, and Poor. Further vehicle research on safety ratings and features, reviews, tips and more can be found here: www.iihs.org/iihs/ratings.

The overall IIHS Crashworthiness / Safety Rating for this vehicle is "Good".

Diagnostic Trouble Codes (DTCs)

Diagnostic Trouble Codes (DTCs) are set by a control module when it detects faults in its system through self-diagnostics. The following section lists DTCs retrieved from various control modules of the vehicle.

Engine Control Module (ECM) — No Issues Found

Transmission Control Module (TCM) — No Issues Found

Freeze Frame Data

Freeze Frame Data refers to a snapshot taken by a control module when it detects a fault in its system. The snapshot consists of measured values from various sensors and can be useful in determining the root cause of the fault. Note that not all vehicles support the items listed below and thus some values may be inaccurate.

No freeze frame data for DTCs (Diagnostic Trouble Codes) were retrieved from the ECM (Engine Control Module) or TCM (Transmission Control Module).

EXPOSURE / AUTO PHYSICAL DAMAGES

This section provides predictive loss and repair estimate/cost information. AI inputs: Trusted Repair Estimates, Max Delta-V, Impact Angle, Vehicle Model/Specs (weight, stiffness), Airbag Deployment status, DTCs, Damage Area/Level/Photographs (if any).

Repair Estimate (AI Prediction)	Salvage Value (80% of Market Value)	Prediction: Total Loss / Repairable	Value Certainty
R 679,339.46	N/A	N/A	N/A

Event Data Disclaimer

It is important to note is that if a vehicle was spinning or rolling surrounding the collision, then the report's speed measurements would not accurately reflect the actual speed of the vehicle during/after it lost control; the speed measurement is typically based on the wheel speed sensor. Signs of this type of anomaly would be rapid changes in speed between the brief timing intervals. The reported speed may be an average of the four wheels; thus could also be skewed by spinning wheels. In combination with scene evidence, an expert could assess vehicle speed by analyzing the data via accident reconstruction and engineering analysis.

Users of the Collision Sciences service and reviewers of the reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Collision Sciences Inc. and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Collision Sciences Inc. expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the online services, evidence logistics, EDR data, EDR software or use thereof.

Injury Risk / Biomechanical Assessment Disclaimer

The estimated injury risks are calculated based on the recorded crash pulse, relative energy changes, known vehicle characteristics in standardized and real-world crashes, published databases, and recognized studies. The provided information can be used as a guide in settlement decisions but cannot be used to definitively prove the existence or non-presence of an injury. In cases with a very low risk of whiplash or other injury, claims can be identified for further investigation. Conversely, for cases with a high risk of whiplash or other injury, the claim can be expedited, since early treatment is often effective in reducing the long term prognosis.

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010). Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Hell et al., 2002) and Sweden (Krafft et al., 2005). Injury risk studies consider the following risk factors: Crash configuration (front, side, rear, rollover), Delta-V = Change in velocity, Vehicle mass (size, weight), Vehicle stiffness, Vehicle geometry and engagement, Restraint system and its adjustment, Occupant seated position, Occupant profile (age, gender, previous injury), Number of WAD symptoms, and Psychological Distress. Structural damage and known whiplash thresholds overlap, indicating structural damage and repair cost are a poor predictor of minor injury threshold. Damage can also vary widely by vehicle model and impact configuration.

CRASH DATA RETRIEVAL

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	WVWZZZAUZJW******
User	
Case Number	
EDR Data Imaging Date	05/16/2019
Crash Date	
Filename	WVWZZZAUZJW257118_ACM 2018 VOLKSWAGEN GOLF GTI - COPY.CDRX
Saved on	Thursday, May 16 2019 at 10:04:25
Imaged with CDR version	Crash Data Retrieval Tool 17.10
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 17.10
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	Record 1 (CRC Check Failed - Saved Without VIN Sequence Number), Record 2 (CRC Check Failed - Saved Without VIN Sequence Number), Record 3 (CRC Check Failed - Saved Without VIN Sequence Number), Record 4 (CRC Check Failed - Saved Without VIN Sequence Number), Record 5 (CRC Check Failed - Saved Without VIN Sequence Number), Record 6 (CRC Check Failed - Saved Without VIN Sequence Number)

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

General Information:
These limitations are intended to assist you in reading the event data that has been imaged from the vehicle's Airbag Control Module (ACM). They are not intended to provide specific information regarding the interpretation of this data. Event data should be examined in conjunction with other available physical evidence from the vehicle and scene.

> **Note**: The ACM's current DTC status will be altered if the ACM is powered-up without the vehicle periphery connected. This situation might occur when the CDR tool is connected directly to the ACM (e.g. for bench top imaging). It will not affect the stored EDR data, but may result in additional DTCs within the ACM.
>
> **Note**: During bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. Also, after a CDR imaging process, wait one minute after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for bench top imaging could cause new events to be recorded in the ACM.

Recorded Crash Events:
This ACM is capable of recording up to 6 deployment events of front, side, rear or rollover events within its memory. Each record contains 5 seconds of pre-crash data and at least 300ms of post-crash data. Deployment events are locked into memory and cannot be overwritten. Non-deployment events can be overwritten by subsequent deployment or non-deployment events. The oldest non-deployment event will be overwritten first. Some ACMs stop over-writing of older non-deployment events by more recent non-deployment events after a certain number of events (more than 1000). Under these conditions, the storage of deployment events is still available. The event counter is incremented for each event and stored within the data record.

Deployment events are recorded, when a non-reversible restraint system was commanded to deploy. Recording of non-deployment events requires a minimum delta-V of 8km/h within a 150ms period in either longitudinal or lateral direction. Reversible restraint systems (e.g. active headrests) that have been commanded to deploy also trigger recording of a non-deployment event. Time Zero of an event is determined by the ACM's algorithms based on the acceleration and/or pressure sensors or a deployment command. Post-crash data (e.g. deployment time of restraint systems) is reported relative to Time Zero.

The ACM supports recording of multiple events. In case of a rapid sequence of events (e.g. a combined frontal and side event), the ACM will record the data within a common EDR entry (a so-called parallel event). In this case, the post-crash data is reported relative to Time Zero of the initial event. If the initial event has already ended and another event happens within a time period of 5s from Time Zero of the initial event, the ACM will record a multi-event consisting of two or more separate EDR entries.

If power to the ACM was lost during an event, all or part of the event data record may not have been recorded.

Data:
The reported data elements may vary by vehicle model, model year or vehicle configuration. Part of the pre-crash data has been transmitted to the ACM by various vehicle control modules via the vehicle's communication network.

Time-continuous pre-crash data is recorded at two samples per second for 5 seconds before Time Zero. The main data elements are:

- Speed Vehicle Indicated: is reported as displayed by the vehicle's instrument cluster. The vehicle speed is evaluated as an average of wheel speeds and transmitted via the vehicle communication network to the ACM. Its data accuracy may be affected by various factors, such as significant changes in tire size from the factory settings, wheel lock-up or slip.
- Accelerator Pedal: is the ratio of the accelerator pedal's position compared to the fully depressed position (in percent). The pedal position sensor is wired to the Engine Control Module.
- Service Brake Activation: is the status of the brake pedal switch. The switch is wired to the Engine Control Module.
- Engine RPM (Combustion Engine): as reported by the Engine Control Module.
- Steering Input: as reported by the wheel angle sensor.
- ABS Activity: as reported by the Electronic Stability Control Module.
- Stability Control: as reported by the Electronic Stability Control Module.

The pre-crash status is recorded 1 second before. The main data elements are:

- Safety Belt Status: as evaluated by the belt-switches that are wired to the ACM.
- Seat Track Position Switch: as evaluated by the seat track position sensors that are wired to the ACM.
- Airbag Warning Lamp, Status: as commanded by the ACM.
- Occupant Size Classification, Front Passenger: as reported by the occupant classification system.
- Frontal Airbag Disable Indicator Status: as commanded by the ACM.

Pre-crash and post-crash data are recorded asynchronously. The data element "Time from Last Speed Data Sample (Precrash) to Time Zero" indicates the time delay between the most recent pre-crash data sample and Time Zero (0 to 500ms).

Post-crash data is recorded after Time Zero up to 300ms. The Vehicle Roll Angle may be recorded for 5 seconds post-crash. The main data elements are:

- Event Type: indicates the event type depending on the algorithm that triggered the recording criteria first (deployment or Delta-V threshold).
- Multi-Event, Number of Events: determines the chronological order of records being part of a multi-event.
- Time from Previous / Initial Event to Current Event: indicates the time difference between records of multi-events.
- Delta-V Longitudinal / Lateral: are recorded every 10ms from Time Zero to 250ms. Delta-V reflects the change in velocity that the ACM experienced during the recorded time period. It does not necessarily correlate with vehicle traveling speed.
- Longitudinal / Lateral / Normal Acceleration: are recorded every 10ms from Time Zero to 250ms (if supported by the ACM). The reported range of acceleration may vary between ACM models. This ACM provides +/- 120g accelerometer range (longitudinal) and +/-120g accelerometer range (lateral).
- Clipping Time, Longitudinal / Lateral Acceleration Sensor: depending on the severity of the event, the measuring range of the longitudinal or lateral accelerometers may be exceeded. The data elements "Clipping Time, Longitudinal / Lateral Acceleration Sensor" indicate the time within an event when the measurement first exceeded the design range of the sensor. As a result, subsequent Delta-V values may be underestimated.
- Vehicle Roll Angle: is recorded every 100ms from 1 second before and up to 5 seconds after Time Zero. Due to mechanical limitations of the roll rate sensor, high accelerations, which can occur during front, side or rear crashes, can disturb the oscillating angular rate sensing element. This results in the roll rate data being temporarily invalid for a short period of time (at or shortly after Time Zero).
- Time to Deployment: indicates the time at which the ACM commanded the deployment of the associated restraint system.
- Disposal: indicates whether the ACM commanded the disposal of the propellant from the associated restraint system. "No Disposal" indicates that the restraint system was commanded to deploy for occupant restraint purposes.
- Date and Time at Event: is reported as the date and time of the vehicle's clock at the time of an event. Since the vehicle clock may be adjusted manually, the reported values may not reflect the actual date and time of given event. As with the other data elements reported herein, these parameters should be examined in conjunction with other available physical evidence from the vehicle and scene.
- Complete File Recorded: indicates if the event data has been completely recorded to the ACM's memory or if the recording process has been interrupted before completion.

The status "Data not Available" is reported if the ACM was unable to store the data element (e.g. due to missing communication) or if an algorithm triggers the recording of a non-deployment event which cannot be classified by any of the following Event types (front, side, rear, rollover, pitchover, pedestrian, HV or external trigger). In this case the event type is reported as data not available. "Invalid Data" reported if the ACM was unable to store valid data for the data element (e.g. range exceeded, communication failure, sensor failure).

Data Sign Convention:

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Lateral Acceleration	Left to Right
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Normal Acceleration	Downward
Vehicle Roll Angle	Left to Right Rotation
Steering Input	Left Turn

CRASH DATA RETRIEVAL

Hexadecimal Data:
Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

14002_VWG2100CO_r003

CRASH DATA RETRIEVAL

System Status at Event (Record 1, Most Recent)

Event Counter at Event (Counts)	13
Event Type	Data Not Available
Multi-Event, Number of Events	4, Event
Time from Initial Event to Current Event (msec)	1,783.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2019-05-07, 11:31:31
Vehicle Mileage (km)	18,580
Operating Time (min)	30,475
Ignition Cycle at Event (Cycles)	1,656
Ignition Cycle at Download (Cycles)	1,661
Maximum Delta-V, Longitudinal (MPH [km/h])	-3.7 [-6]
Time, Maximum Delta-V, Longitudinal (msec)	300.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	0.6 [1]
Time, Maximum Delta-V, Lateral (msec)	235.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	300.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	74
Time from Time Zero to Algorithm Start (Front) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Front) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Side) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Side) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Rear) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rear) (msec)	Algorithm Not Reset
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset
Vehicle Identification Number (VIN)	WVWZZZAUZJW******
Part Number, ACM	5Q0959655BH
Supplier ID, ACM	TSR
Production Date, ACM	180411
Supply Voltage (Before Event) (V)	12.0
Complete File Recorded	Completed Successfully

Deployment Command Data (Record 1, Most Recent)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Knee Airbag, Time to Deployment, Driver (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	Not Deployed
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	Not Deployed

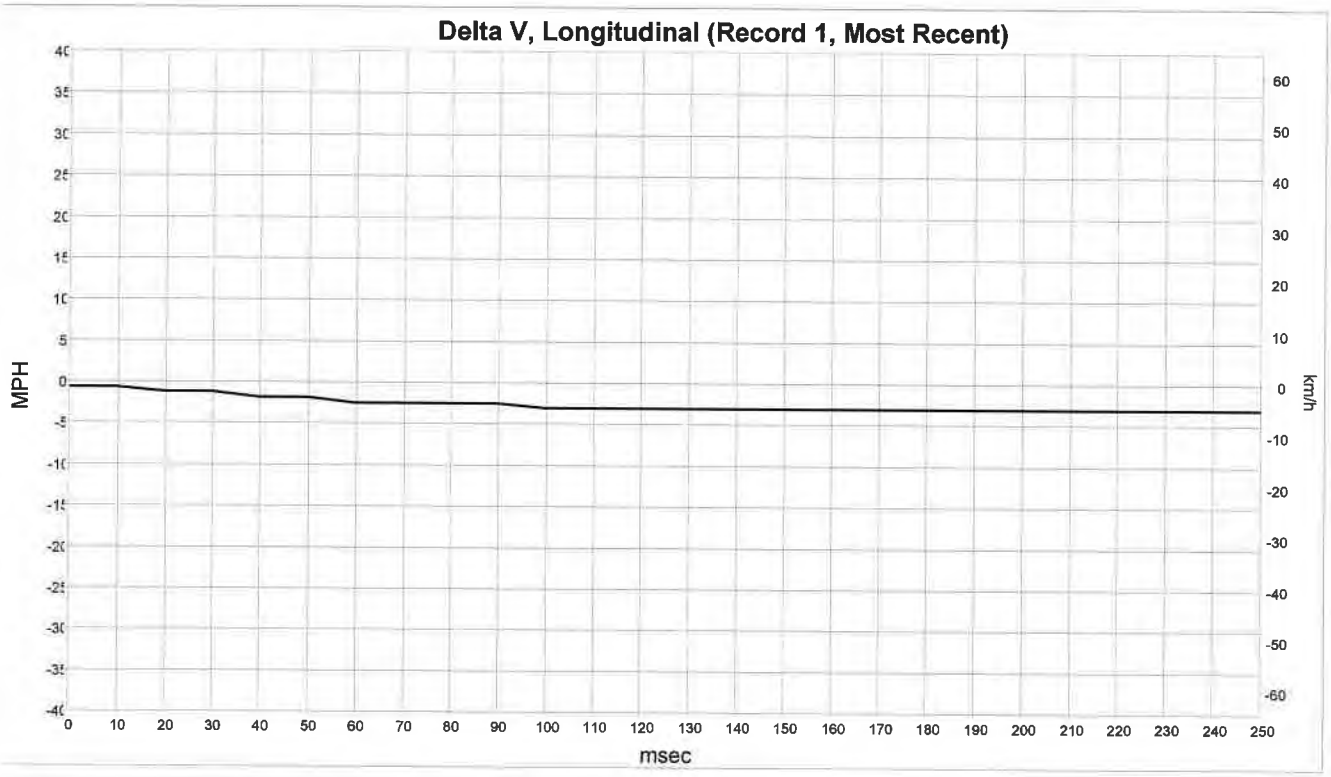
Pre-Crash Data -1 Sec (Record 1, Most Recent)

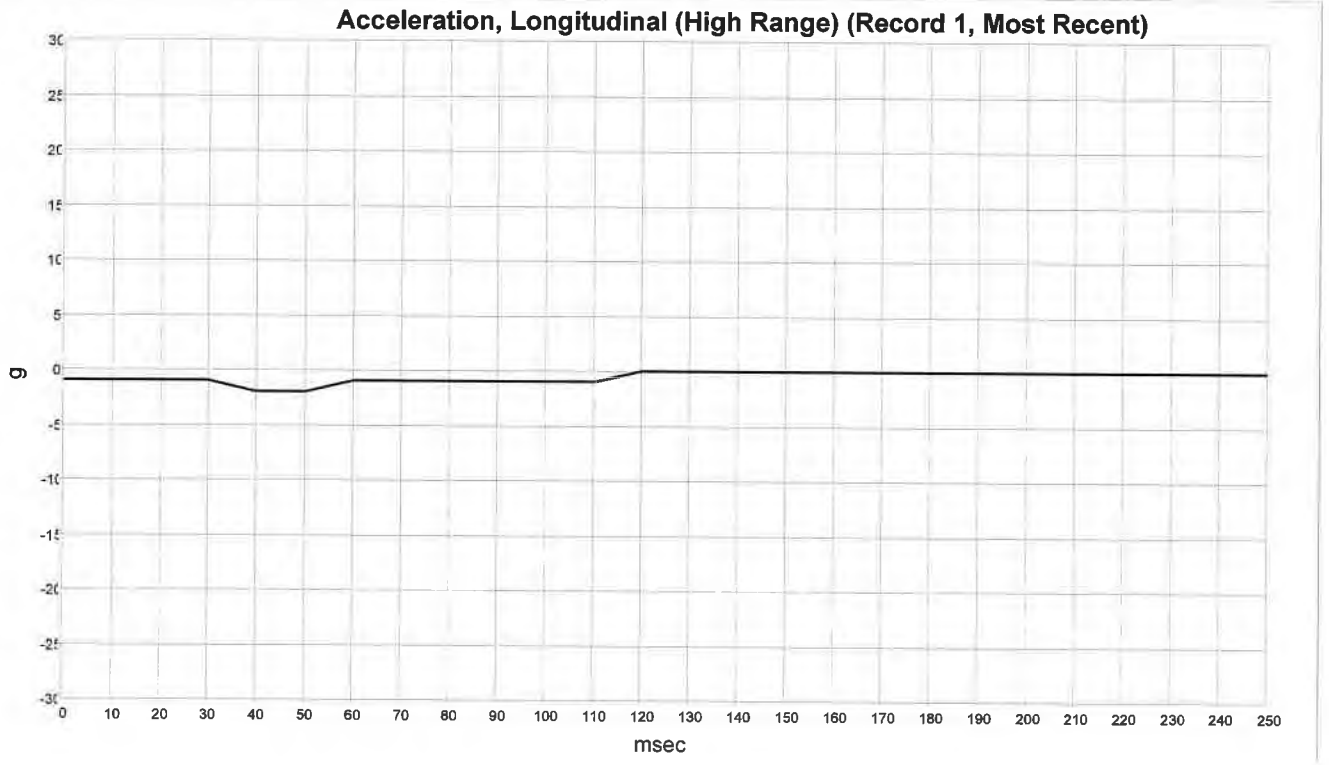
Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Not Belted
Frontal Airbag Disable Indicator Status, Passenger	Off
Airbag Warning Lamp, Status	On
Frontal Airbag Suppression Switch Status, Front Passenger	Not Suppressed

[redacted]

CDR CRASH DATA RETRIEVAL

Longitudinal Crash Pulse (Record 1, Most Recent)





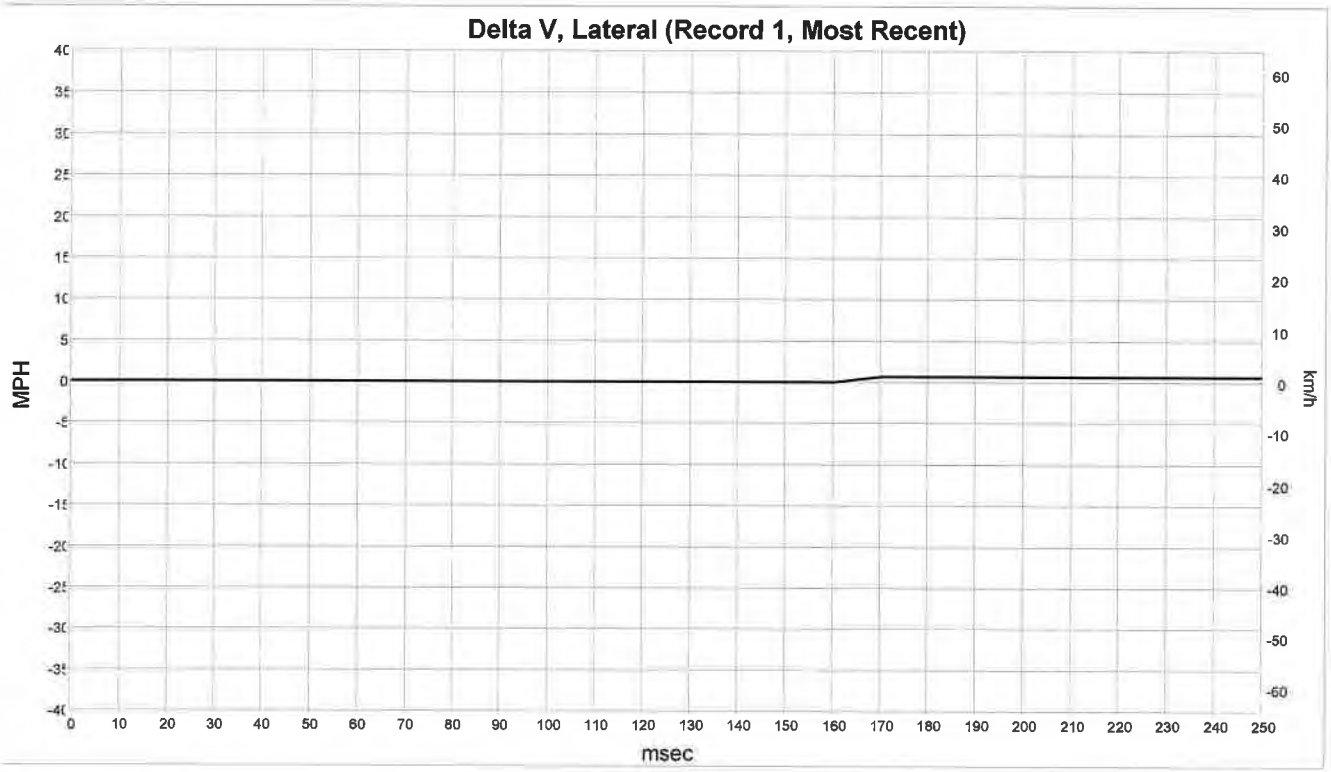
Longitudinal Crash Pulse (Record 1, Most Recent)

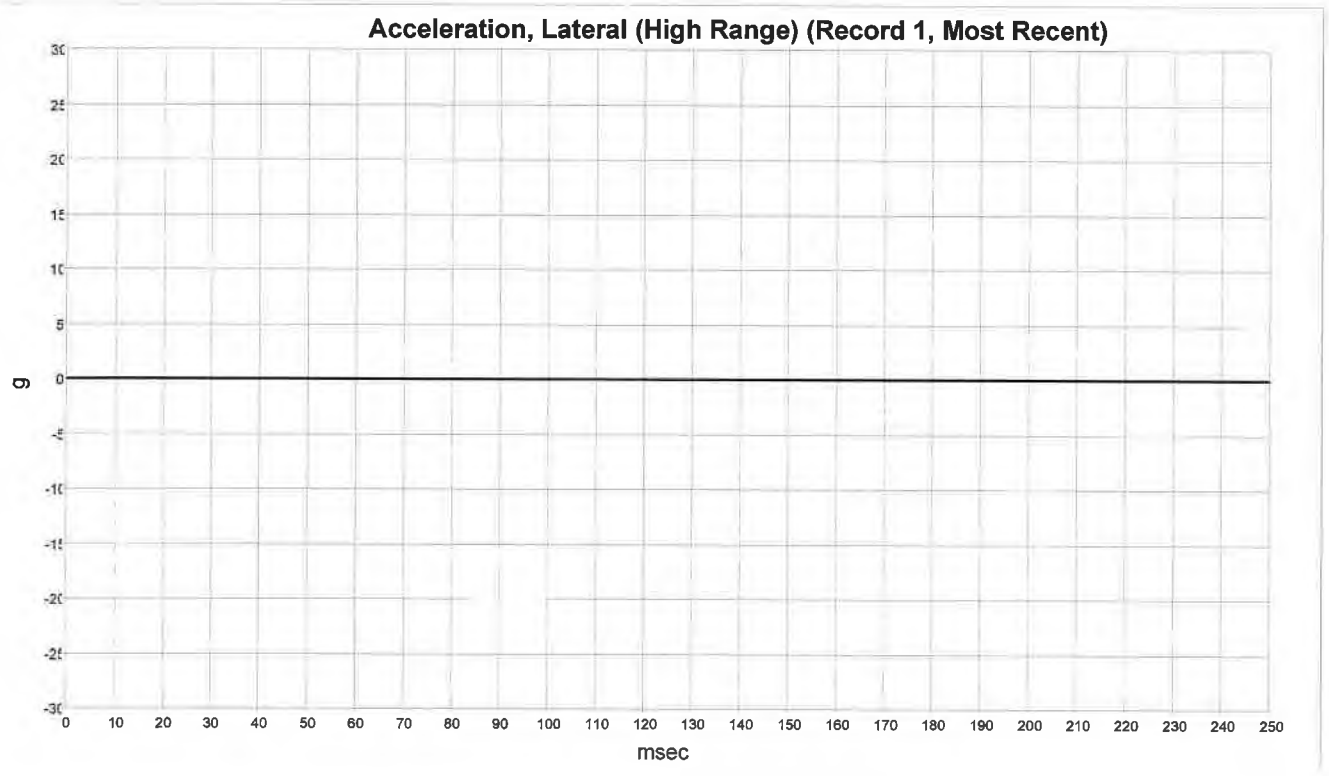
Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	-0.6 [-1]	-0.93
10	-0.6 [-1]	-1.09
20	-1.2 [-2]	-1.32
30	-1.2 [-2]	-1.48
40	-1.9 [-3]	-1.59
50	-1.9 [-3]	-1.55
60	-2.5 [-4]	-1.48
70	-2.5 [-4]	-1.30
80	-2.5 [-4]	-1.07
90	-2.5 [-4]	-0.81
100	-3.1 [-5]	-0.63
110	-3.1 [-5]	-0.51
120	-3.1 [-5]	-0.41
130	-3.1 [-5]	-0.33
140	-3.1 [-5]	-0.26
150	-3.1 [-5]	-0.23
160	-3.1 [-5]	-0.23
170	-3.1 [-5]	-0.23
180	-3.1 [-5]	-0.23
190	-3.1 [-5]	-0.23
200	-3.1 [-5]	-0.23
210	-3.1 [-5]	-0.23
220	-3.1 [-5]	-0.23
230	-3.1 [-5]	-0.23
240	-3.1 [-5]	-0.23
250	-3.1 [-5]	-0.23

[redacted]

CDR CRASH DATA RETRIEVAL

Lateral Crash Pulse (Record 1, Most Recent)





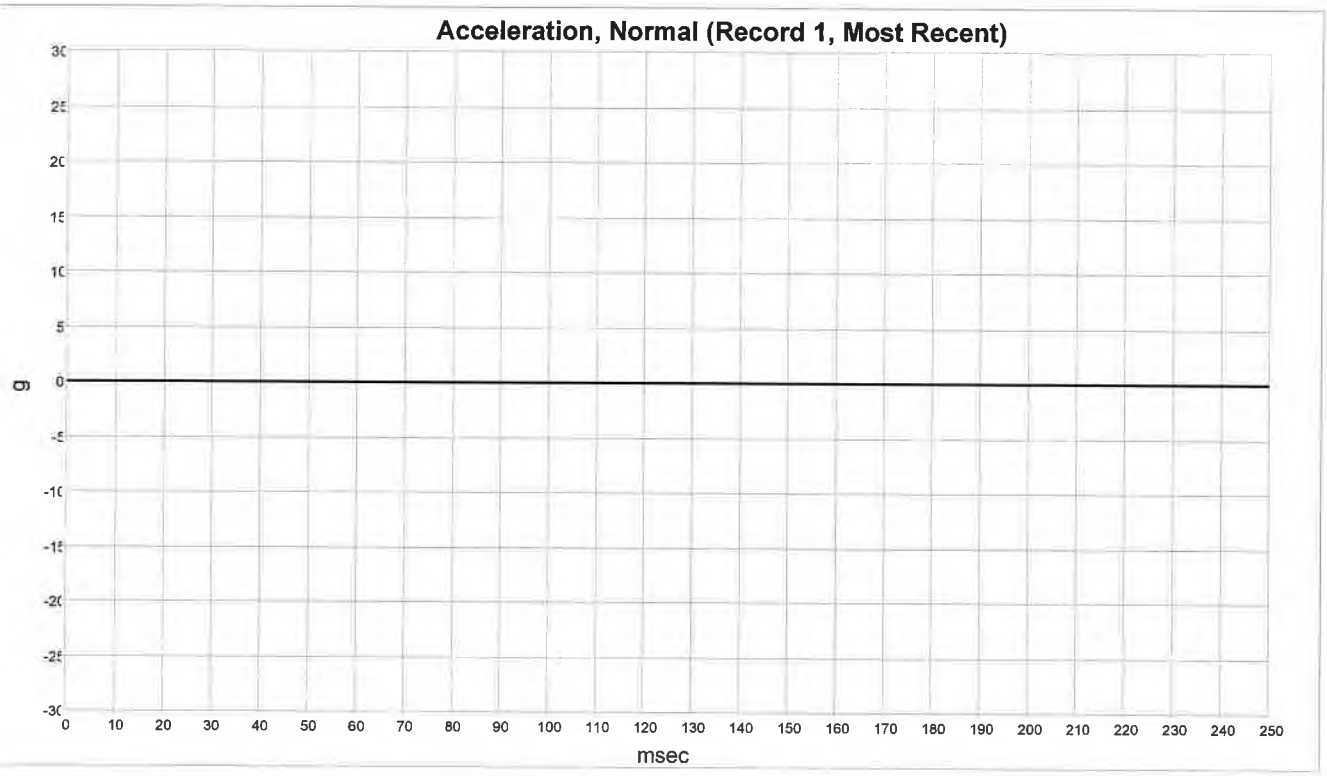
Lateral Crash Pulse (Record 1, Most Recent)

Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	0.00
10	0.0 [0]	-0.29
20	0.0 [0]	-0.21
30	0.0 [0]	-0.24
40	0.0 [0]	-0.15
50	0.0 [0]	-0.09
60	0.0 [0]	0.00
70	0.0 [0]	0.07
80	0.0 [0]	0.03
90	0.0 [0]	0.00
100	0.0 [0]	0.10
110	0.0 [0]	0.27
120	0.0 [0]	0.35
130	0.0 [0]	0.32
140	0.0 [0]	0.30
150	0.0 [0]	0.30
160	0.0 [0]	0.33
170	0.6 [1]	0.34
180	0.6 [1]	0.34
190	0.6 [1]	0.34
200	0.6 [1]	0.34
210	0.6 [1]	0.38
220	0.6 [1]	0.38
230	0.6 [1]	0.38
240	0.6 [1]	0.34
250	0.6 [1]	0.26

[redacted]

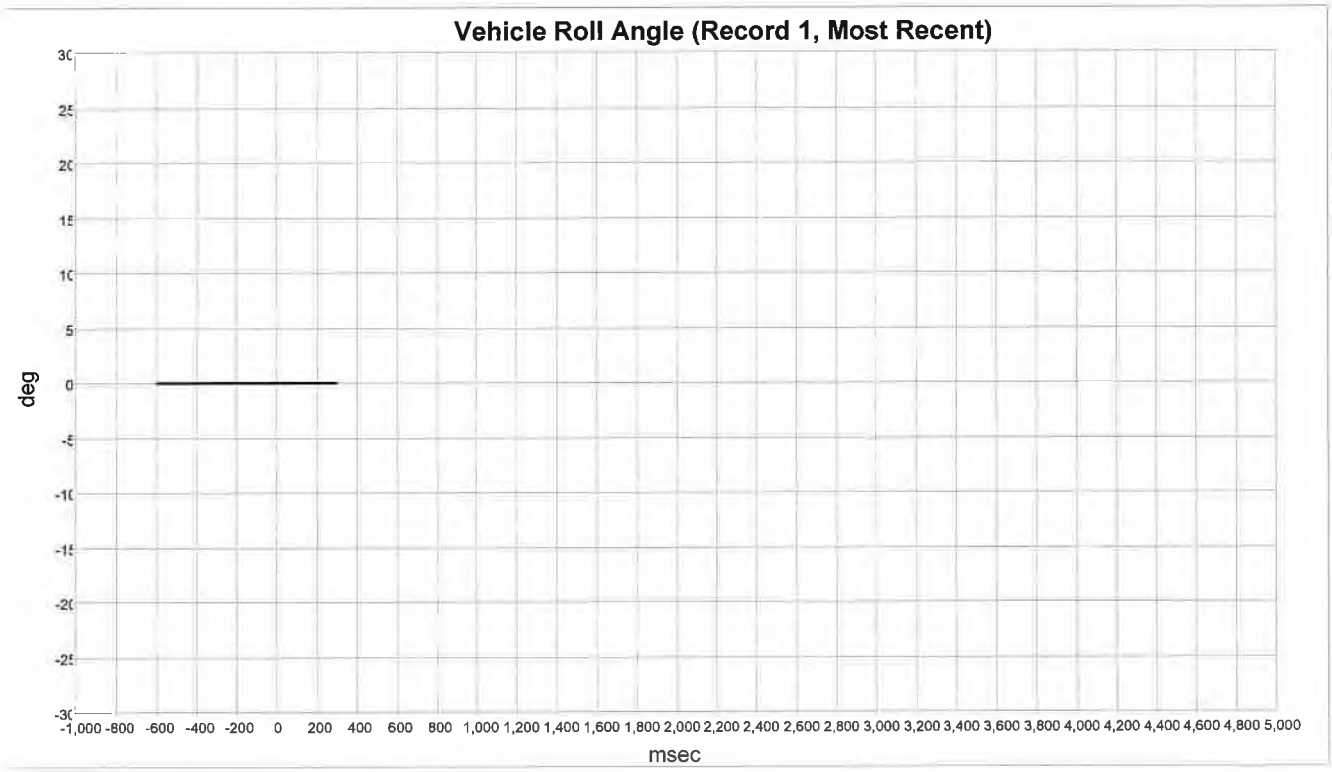
CDR CRASH DATA RETRIEVAL

Normal Acceleration (Record 1, Most Recent)



Time (msec)	Normal Acceleration (g)
0	0.0
10	0.0
20	0.0
30	0.0
40	0.0
50	0.0
60	0.0
70	0.0
80	0.0
90	0.0
100	0.0
110	0.0
120	0.0
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Angle (Record 1, Most Recent)



Time (msec)	Vehicle Roll Angle (deg)
-1000	Data Not Available
-900	Data Not Available
-800	Data Not Available
-700	Data Not Available
-600	0
-500	0
-400	0
-300	0
-200	0
-100	0
0	0
100	0
200	0
300	0
400	Data Not Available
500	Data Not Available
600	Data Not Available
700	Data Not Available
800	Data Not Available
900	Data Not Available
1000	Data Not Available
1100	Data Not Available
1200	Data Not Available
1300	Data Not Available
1400	Data Not Available
1500	Data Not Available
1600	Data Not Available

Time (msec)	Vehicle Roll Angle (deg)
1700	Data Not Available
1800	Data Not Available
1900	Data Not Available
2000	Data Not Available
2100	Data Not Available
2200	Data Not Available
2300	Data Not Available
2400	Data Not Available
2500	Data Not Available
2600	Data Not Available
2700	Data Not Available
2800	Data Not Available
2900	Data Not Available
3000	Data Not Available
3100	Data Not Available
3200	Data Not Available
3300	Data Not Available
3400	Data Not Available
3500	Data Not Available
3600	Data Not Available
3700	Data Not Available
3800	Data Not Available
3900	Data Not Available
4000	Data Not Available
4100	Data Not Available
4200	Data Not Available
4300	Data Not Available
4400	Data Not Available
4500	Data Not Available
4600	Data Not Available
4700	Data Not Available
4800	Data Not Available
4900	Data Not Available
5000	Data Not Available

[redacted]

CDR CRASH DATA RETRIEVAL

System Status at Event (Record 2)

Event Counter at Event (Counts)	12
Event Type	Frontal
Multi-Event, Number of Events	3. Event
Time from Initial Event to Current Event (msec)	604.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2000-00-Invalid, 00:00:00
Vehicle Mileage (km)	Invalid Data
Operating Time (min)	30,475
Ignition Cycle at Event (Cycles)	1,656
Ignition Cycle at Download (Cycles)	1,661
Maximum Delta-V, Longitudinal (MPH [km/h])	-1.9 [-3]
Time, Maximum Delta-V, Longitudinal (msec)	300.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	-0.6 [-1]
Time, Maximum Delta-V, Lateral (msec)	265.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	300.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	253
Time from Time Zero to Algorithm Start (Front) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Front) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Side) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Side) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Rear) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rear) (msec)	Algorithm Not Reset
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset
Vehicle Identification Number (VIN)	WVWZZZAUZJW******
Part Number, ACM	5Q0959655BH
Supplier ID, ACM	TSR
Production Date, ACM	180411
Supply Voltage (Before Event) (V)	12.6
Complete File Recorded	Completed Successfully

Deployment Command Data (Record 2)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Knee Airbag, Time to Deployment, Driver (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	Not Deployed
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	Not Deployed

Pre-Crash Data -1 Sec (Record 2)

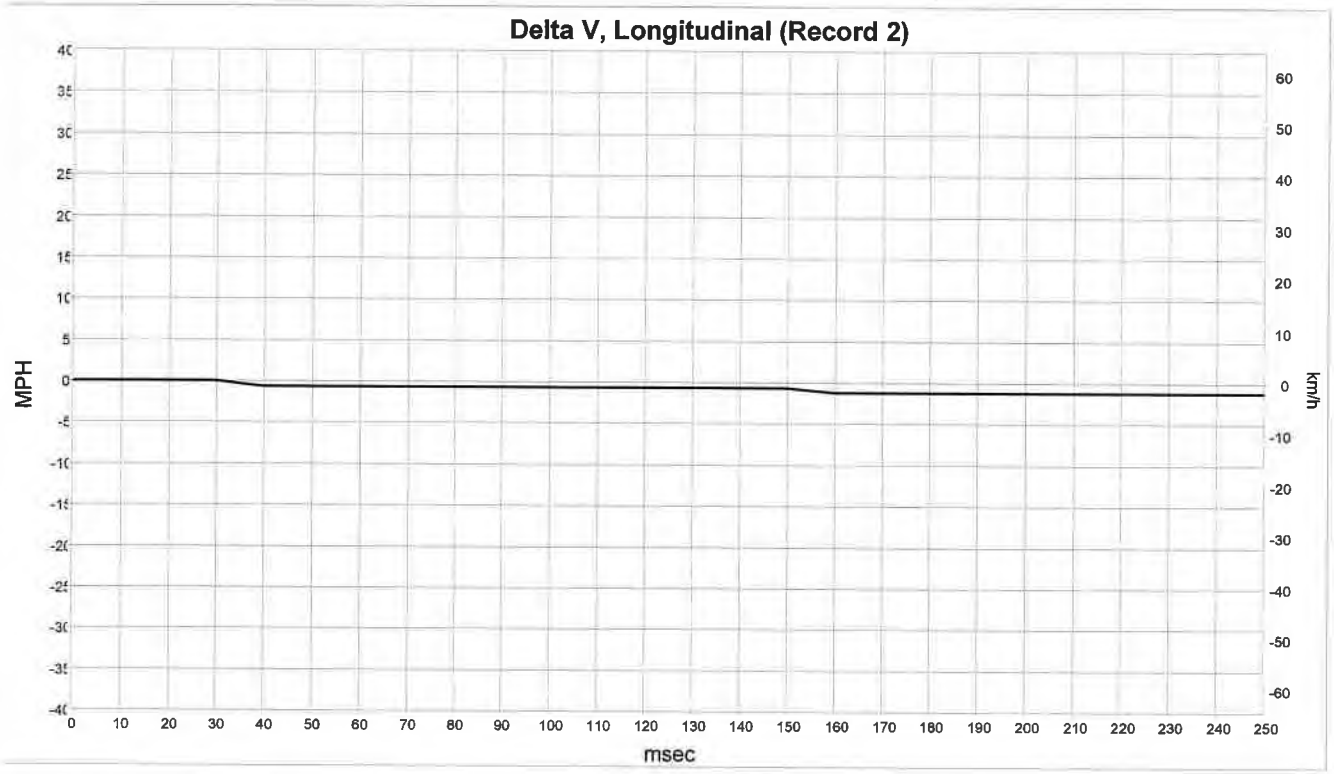
Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Not Belted
Frontal Airbag Disable Indicator Status, Passenger	Off
Airbag Warning Lamp, Status	On
Frontal Airbag Suppression Switch Status, Front Passenger	Not Suppressed

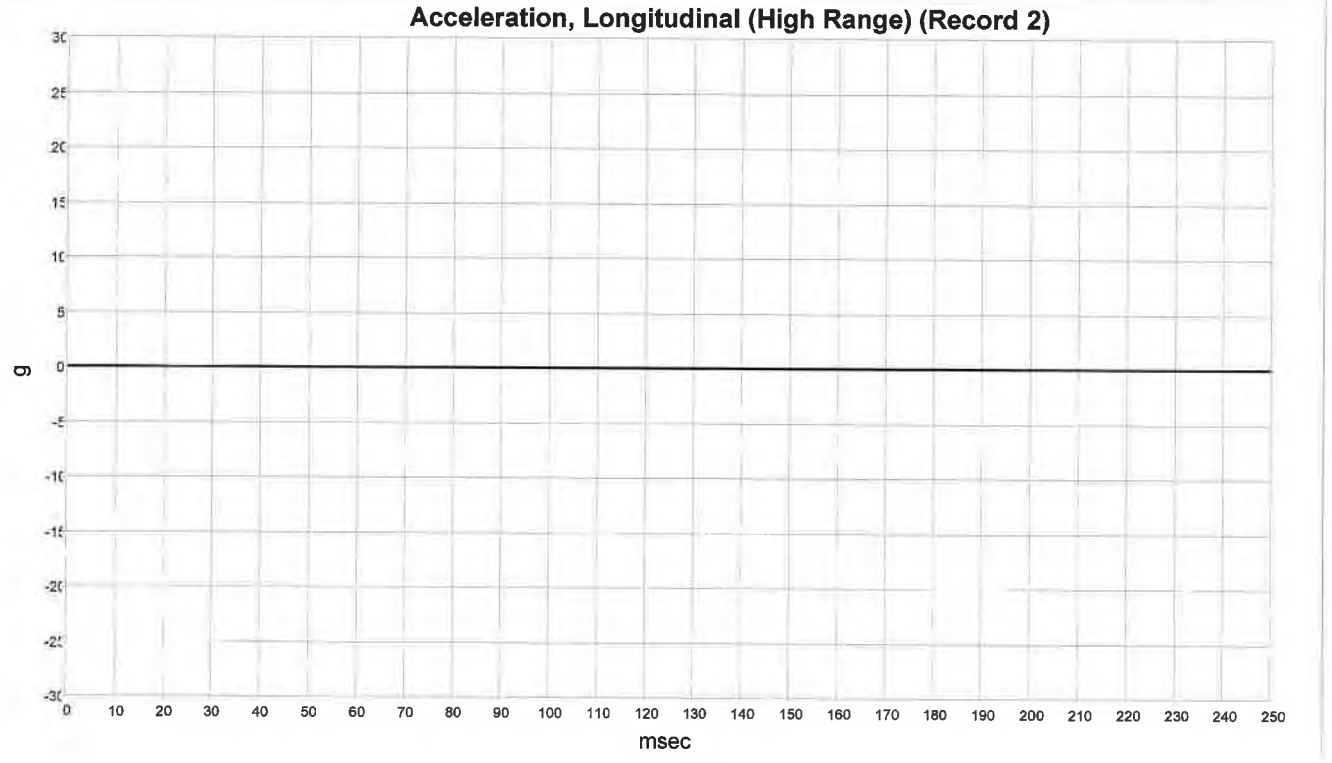
Pre-Crash Data -5 to 0 sec (Record 2)

Time (sec)	Engine RPM (Combustion Engine) (RPM)	ABS Activity	Stability Control	Steering Input (deg)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	4416	No ABS Activity	No ESC Activity	0	96 [154]	0	Off
-4.5	4352	No ABS Activity	No ESC Activity	0	94 [152]	0	Off
-4.0	4288	No ABS Activity	No ESC Activity	0	93 [150]	0	Off
-3.5	4160	No ABS Activity	No ESC Activity	0	91 [147]	0	On (Driver)
-3.0	3968	No ABS Activity	No ESC Activity	0	87 [140]	0	On (Driver)
-2.5	3456	No ABS Activity	No ESC Activity	0	83 [134]	0	On (Driver)
-2.0	2880	No ABS Activity	No ESC Activity	0	80 [128]	0	On (Driver)
-1.5	2496	No ABS Activity	No ESC Activity	12	71 [115]	0	On (Driver)
-1.0	2112	ABS Activity	No ESC Activity	20	57 [91]	0	On (Driver)
-0.5	1600	ABS Activity	ESC Activity	198	43 [70]	0	On (Driver)
0.0	448	No ABS Activity	No ESC Activity	94	8 [13]	0	On (Driver)

CRASH DATA RETRIEVAL

Longitudinal Crash Pulse (Record 2)



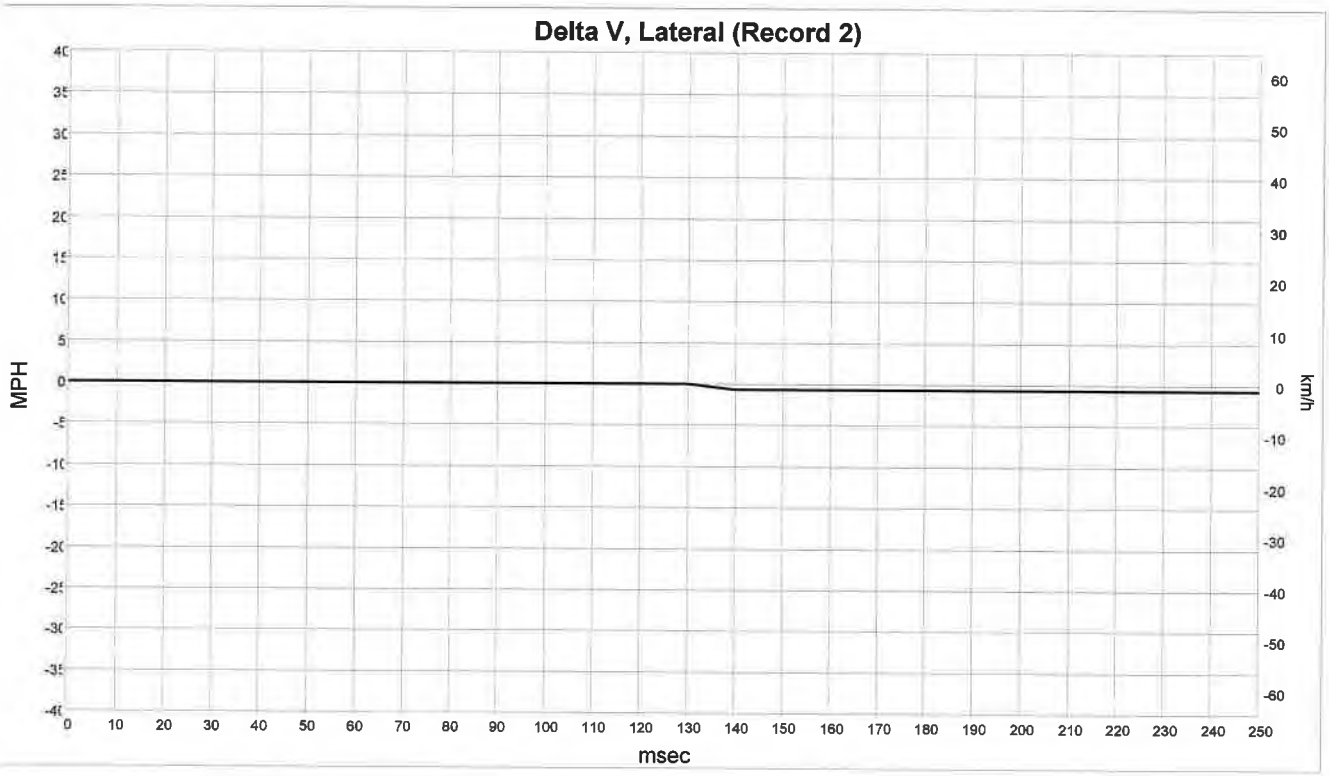


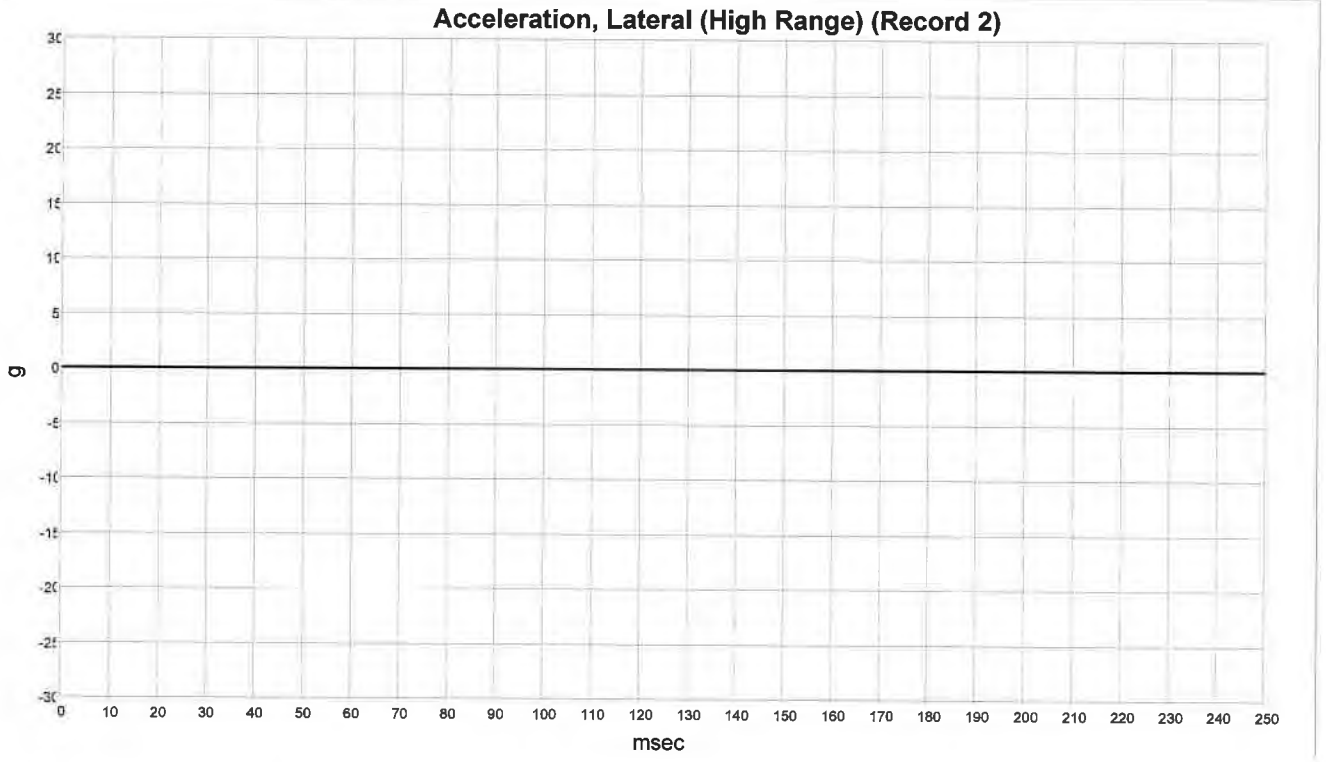
Longitudinal Crash Pulse (Record 2)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	0.0 [0]	-0.30
10	0.0 [0]	-0.27
20	0.0 [0]	-0.28
30	0.0 [0]	-0.38
40	-0.6 [-1]	-0.42
50	-0.6 [-1]	-0.42
60	-0.6 [-1]	-0.39
70	-0.6 [-1]	-0.32
80	-0.6 [-1]	-0.30
90	-0.6 [-1]	-0.32
100	-0.6 [-1]	-0.32
110	-0.6 [-1]	-0.32
120	-0.6 [-1]	-0.32
130	-0.6 [-1]	-0.32
140	-0.6 [-1]	-0.32
150	-0.6 [-1]	-0.38
160	-1.2 [-2]	-0.38
170	-1.2 [-2]	-0.38
180	-1.2 [-2]	-0.38
190	-1.2 [-2]	-0.34
200	-1.2 [-2]	-0.34
210	-1.2 [-2]	-0.35
220	-1.2 [-2]	-0.37
230	-1.2 [-2]	-0.37
240	-1.2 [-2]	-0.37
250	-1.2 [-2]	-0.37

CRASH DATA RETRIEVAL

Lateral Crash Pulse (Record 2)

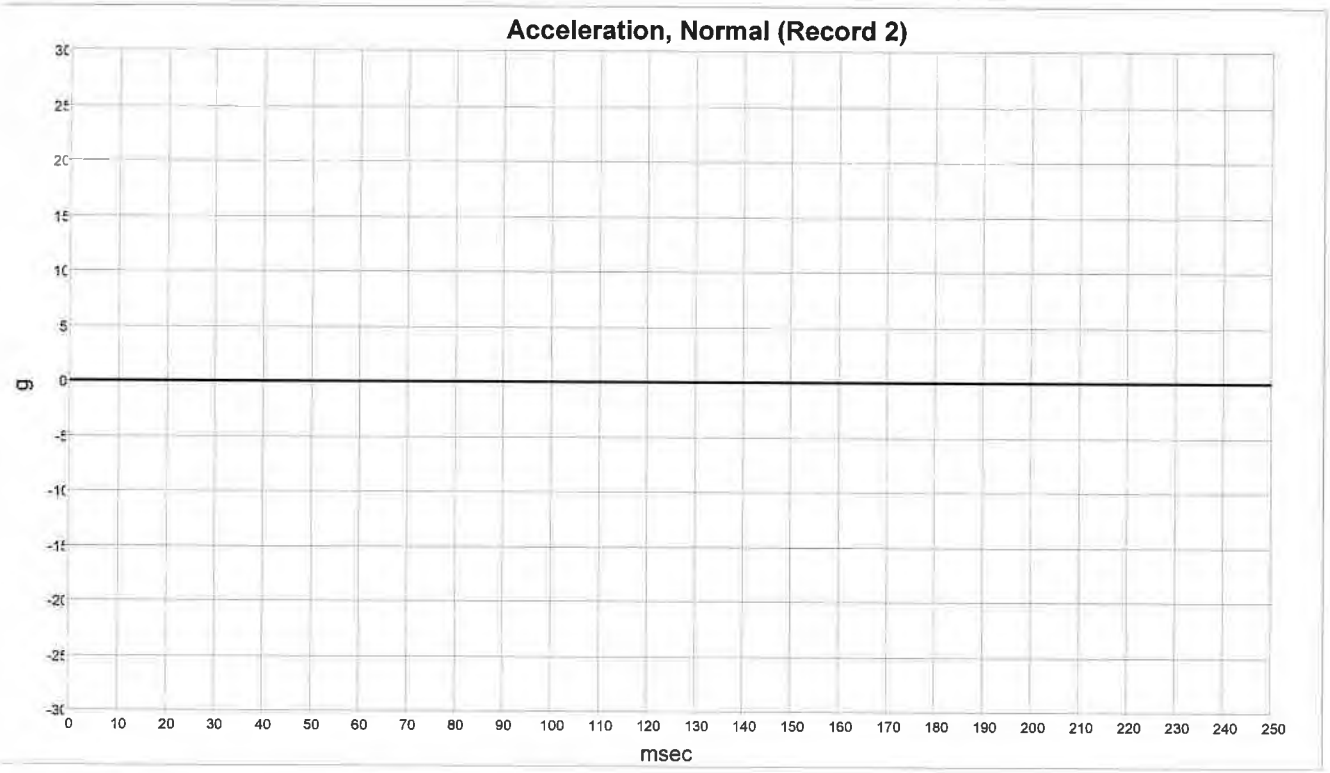




Lateral Crash Pulse (Record 2)

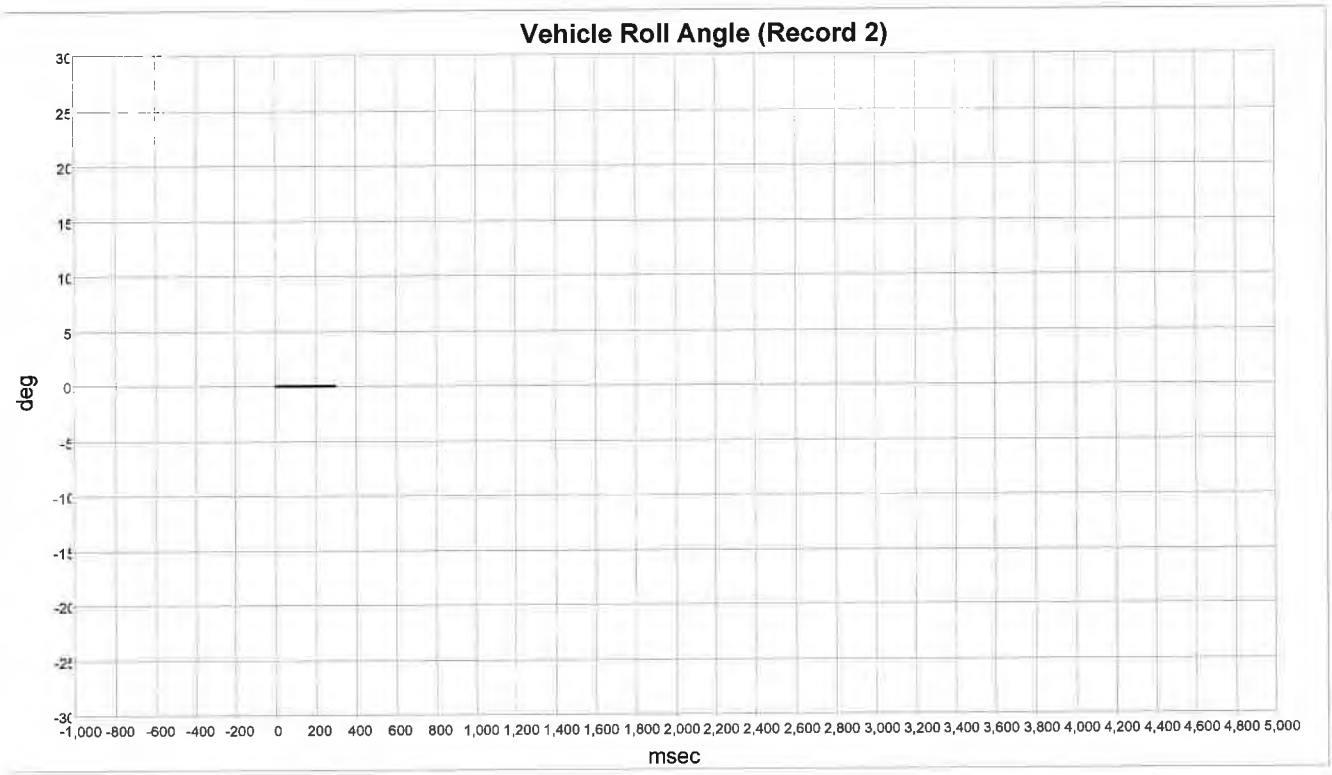
Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	-0.34
10	0.0 [0]	-0.25
20	0.0 [0]	-0.24
30	0.0 [0]	-0.23
40	0.0 [0]	-0.23
50	0.0 [0]	-0.23
60	0.0 [0]	-0.23
70	0.0 [0]	-0.20
80	0.0 [0]	-0.20
90	0.0 [0]	-0.20
100	0.0 [0]	-0.20
110	0.0 [0]	-0.22
120	0.0 [0]	-0.23
130	0.0 [0]	-0.26
140	-0.6 [-1]	-0.29
150	-0.6 [-1]	-0.31
160	-0.6 [-1]	-0.31
170	-0.6 [-1]	-0.31
180	-0.6 [-1]	-0.30
190	-0.6 [-1]	-0.25
200	-0.6 [-1]	-0.22
210	-0.6 [-1]	-0.22
220	-0.6 [-1]	-0.22
230	-0.6 [-1]	-0.18
240	-0.6 [-1]	-0.10
250	-0.6 [-1]	-0.09

Normal Acceleration (Record 2)



Time (msec)	Normal Acceleration (g)
0	0.0
10	0.0
20	0.0
30	0.0
40	0.0
50	0.0
60	0.0
70	0.0
80	0.0
90	0.0
100	0.0
110	0.0
120	0.0
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Angle (Record 2)



Time (msec)	Vehicle Roll Angle (deg)
-1000	Data Not Available
-900	Data Not Available
-800	Data Not Available
-700	Data Not Available
-600	Data Not Available
-500	Data Not Available
-400	Data Not Available
-300	Data Not Available
-200	Data Not Available
-100	Data Not Available
0	0
100	0
200	0
300	0
400	Data Not Available
500	Data Not Available
600	Data Not Available
700	Data Not Available
800	Data Not Available
900	Data Not Available
1000	Data Not Available
1100	Data Not Available
1200	Data Not Available
1300	Data Not Available
1400	Data Not Available
1500	Data Not Available
1600	Data Not Available

[redacted]

CRASH DATA RETRIEVAL

Time (msec)	Vehicle Roll Angle (deg)
1700	Data Not Available
1800	Data Not Available
1900	Data Not Available
2000	Data Not Available
2100	Data Not Available
2200	Data Not Available
2300	Data Not Available
2400	Data Not Available
2500	Data Not Available
2600	Data Not Available
2700	Data Not Available
2800	Data Not Available
2900	Data Not Available
3000	Data Not Available
3100	Data Not Available
3200	Data Not Available
3300	Data Not Available
3400	Data Not Available
3500	Data Not Available
3600	Data Not Available
3700	Data Not Available
3800	Data Not Available
3900	Data Not Available
4000	Data Not Available
4100	Data Not Available
4200	Data Not Available
4300	Data Not Available
4400	Data Not Available
4500	Data Not Available
4600	Data Not Available
4700	Data Not Available
4800	Data Not Available
4900	Data Not Available
5000	Data Not Available

System Status at Event (Record 3)

Event Counter at Event (Counts)	11
Event Type	Frontal
Multi-Event, Number of Events	2. Event
Time from Initial Event to Current Event (msec)	302.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2019-05-07, 11:31:30
Vehicle Mileage (km)	18,580
Operating Time (min)	30,475
Ignition Cycle at Event (Cycles)	1,656
Ignition Cycle at Download (Cycles)	1,661
Maximum Delta-V, Longitudinal (MPH [km/h])	1.2 [2]
Time, Maximum Delta-V, Longitudinal (msec)	75.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	-5.0 [-8]
Time, Maximum Delta-V, Lateral (msec)	295.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	295.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	55
Time from Time Zero to Algorithm Start (Front) (msec)	20
Time from Time Zero to Algorithm Reset (Front) (msec)	103
Time from Time Zero to Algorithm Start (Side) (msec)	15
Time from Time Zero to Algorithm Reset (Side) (msec)	90
Time from Time Zero to Algorithm Start (Rear) (msec)	34
Time from Time Zero to Algorithm Reset (Rear) (msec)	69
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset
Vehicle Identification Number (VIN)	WVWZZZAUZJW******
Part Number, ACM	5Q0959655BH
Supplier ID, ACM	TSR
Production Date, ACM	180411
Supply Voltage (Before Event) (V)	13.0
Complete File Recorded	Completed Successfully

Deployment Command Data (Record 3)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Knee Airbag, Time to Deployment, Driver (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	Not Deployed
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	Not Deployed

Pre-Crash Data -1 Sec (Record 3)

Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Not Belted
Frontal Airbag Disable Indicator Status, Passenger	Off
Airbag Warning Lamp, Status	On
Frontal Airbag Suppression Switch Status, Front Passenger	Not Suppressed

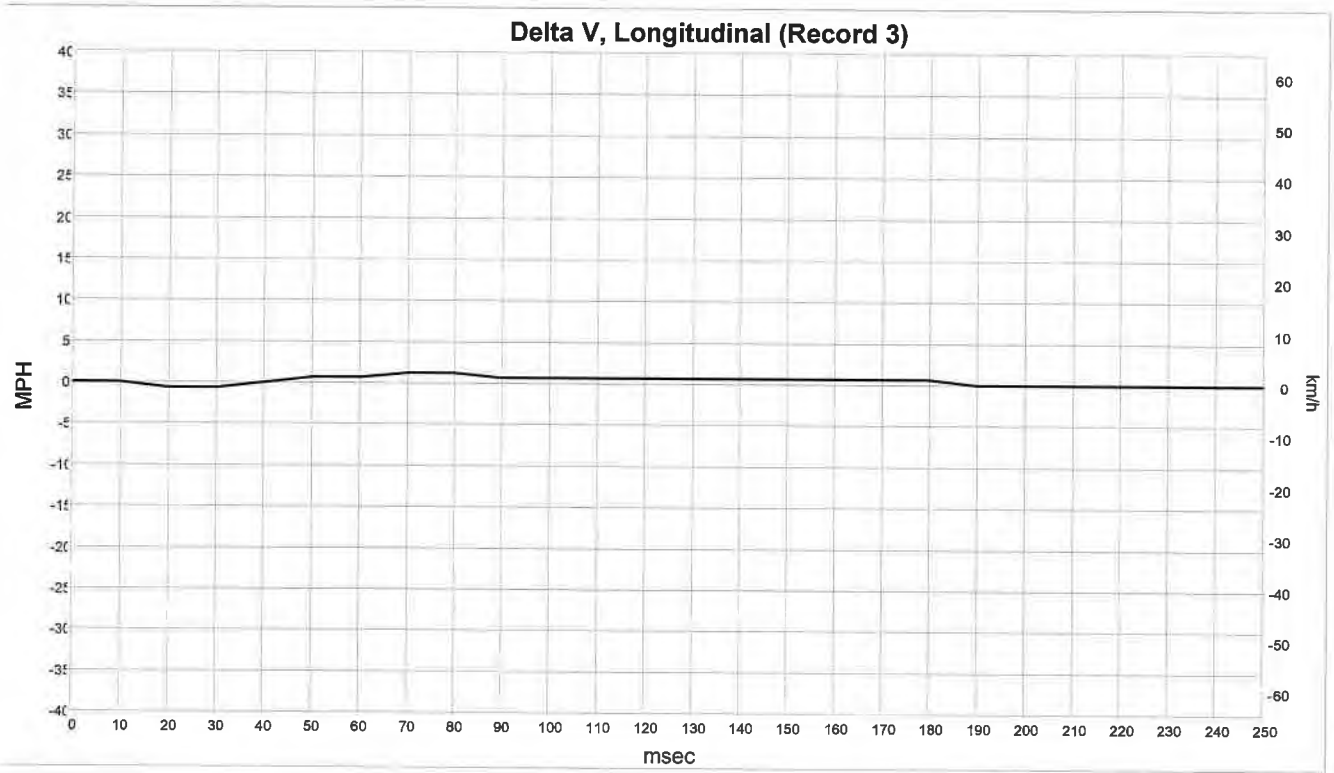
Pre-Crash Data -5 to 0 sec (Record 3)

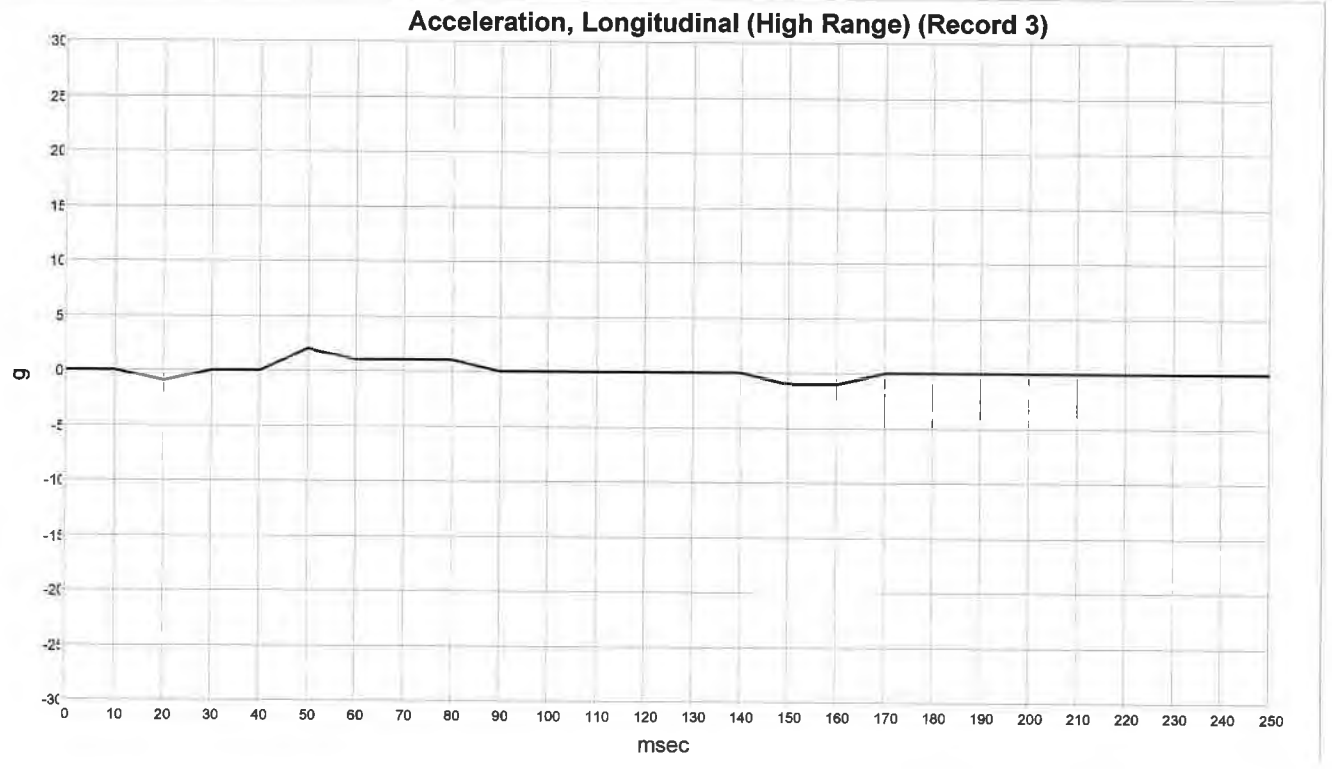
Time (sec)	Engine RPM (Combustion Engine) (RPM)	ABS Activity	Stability Control	Steering Input (deg)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	4416	No ABS Activity	No ESC Activity	0	97 [156]	0	Off
-4.5	4416	No ABS Activity	No ESC Activity	0	96 [154]	0	Off
-4.0	4352	No ABS Activity	No ESC Activity	0	94 [152]	0	Off
-3.5	4288	No ABS Activity	No ESC Activity	0	93 [150]	0	Off
-3.0	4160	No ABS Activity	No ESC Activity	0	91 [147]	0	On (Driver)
-2.5	3968	No ABS Activity	No ESC Activity	0	87 [140]	0	On (Driver)
-2.0	3456	No ABS Activity	No ESC Activity	0	83 [134]	0	On (Driver)
-1.5	2880	No ABS Activity	No ESC Activity	0	80 [128]	0	On (Driver)
-1.0	2496	No ABS Activity	No ESC Activity	12	71 [115]	0	On (Driver)
-0.5	2112	ABS Activity	No ESC Activity	20	57 [91]	0	On (Driver)
0.0	1600	ABS Activity	ESC Activity	198	43 [70]	0	On (Driver)

[redacted]

CRASH DATA RETRIEVAL

Longitudinal Crash Pulse (Record 3)





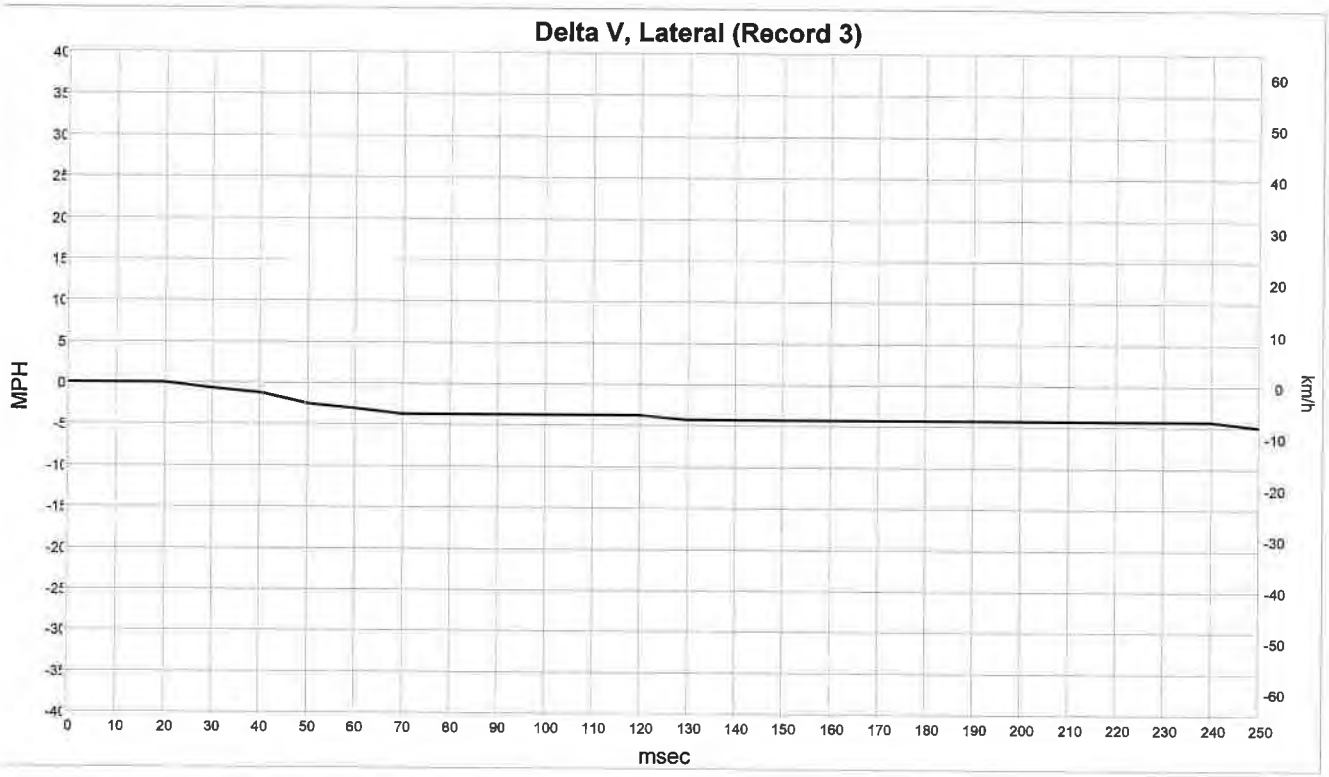
Longitudinal Crash Pulse (Record 3)

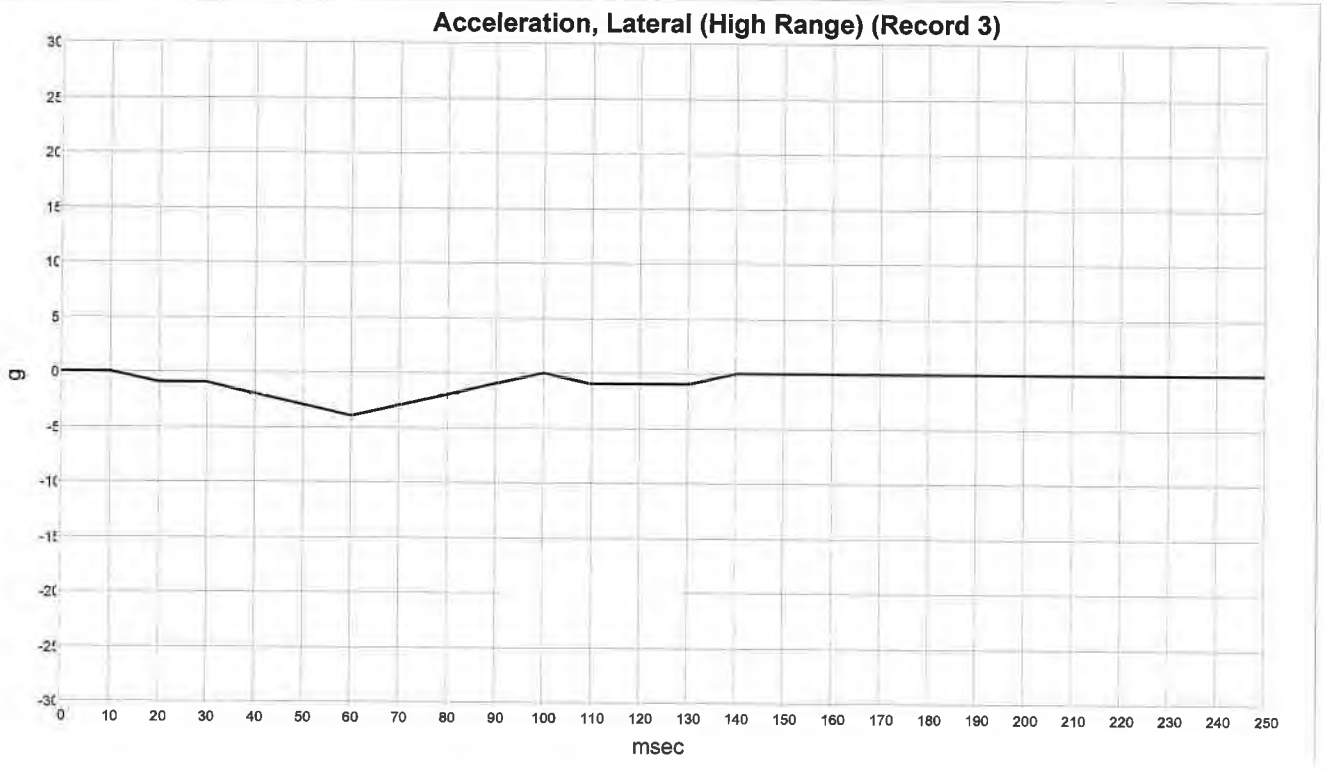
Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	0.0 [0]	-0.46
10	0.0 [0]	-0.45
20	-0.6 [-1]	-0.57
30	-0.6 [-1]	-0.30
40	0.0 [0]	0.28
50	0.6 [1]	1.61
60	0.6 [1]	1.25
70	1.2 [2]	1.45
80	1.2 [2]	0.73
90	0.6 [1]	-0.27
100	0.6 [1]	-0.43
110	0.6 [1]	0.09
120	0.6 [1]	0.25
130	0.6 [1]	0.13
140	0.6 [1]	-0.17
150	0.6 [1]	-0.52
160	0.6 [1]	-0.59
170	0.6 [1]	-0.35
180	0.6 [1]	-0.27
190	0.0 [0]	-0.25
200	0.0 [0]	-0.16
210	0.0 [0]	-0.27
220	0.0 [0]	-0.36
230	0.0 [0]	-0.34
240	0.0 [0]	-0.29
250	0.0 [0]	-0.28

[redacted]

CDR CRASH DATA RETRIEVAL

Lateral Crash Pulse (Record 3)



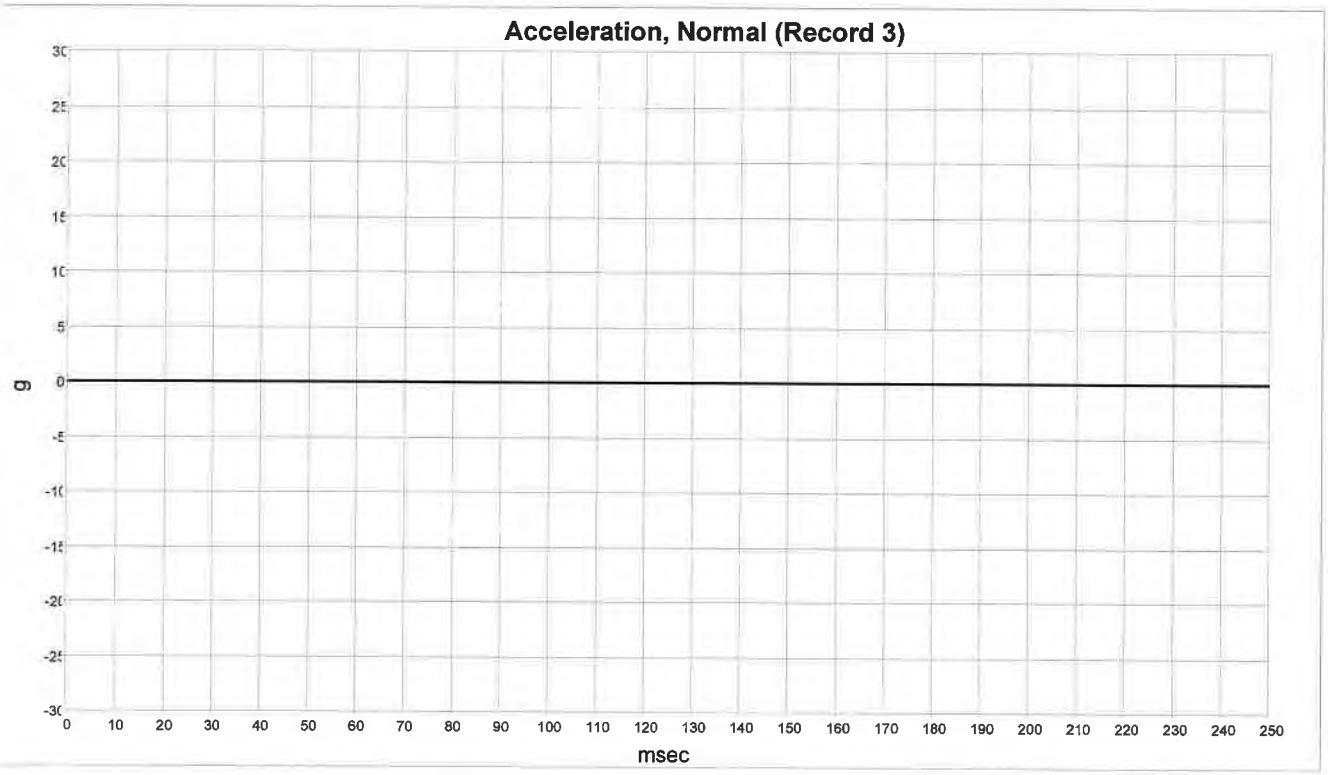


Lateral Crash Pulse (Record 3)

Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	-0.20
10	0.0 [0]	-0.30
20	0.0 [0]	-0.52
30	-0.6 [-1]	-1.20
40	-1.2 [-2]	-2.04
50	-2.5 [-4]	-3.32
60	-3.1 [-5]	-3.70
70	-3.7 [-6]	-3.15
80	-3.7 [-6]	-1.84
90	-3.7 [-6]	-0.88
100	-3.7 [-6]	-0.48
110	-3.7 [-6]	-0.51
120	-3.7 [-6]	-0.70
130	-4.3 [-7]	-0.55
140	-4.3 [-7]	-0.38
150	-4.3 [-7]	-0.04
160	-4.3 [-7]	-0.05
170	-4.3 [-7]	-0.13
180	-4.3 [-7]	-0.34
190	-4.3 [-7]	-0.42
200	-4.3 [-7]	-0.41
210	-4.3 [-7]	-0.41
220	-4.3 [-7]	-0.41
230	-4.3 [-7]	-0.40
240	-4.3 [-7]	-0.43
250	-5.0 [-8]	-0.45

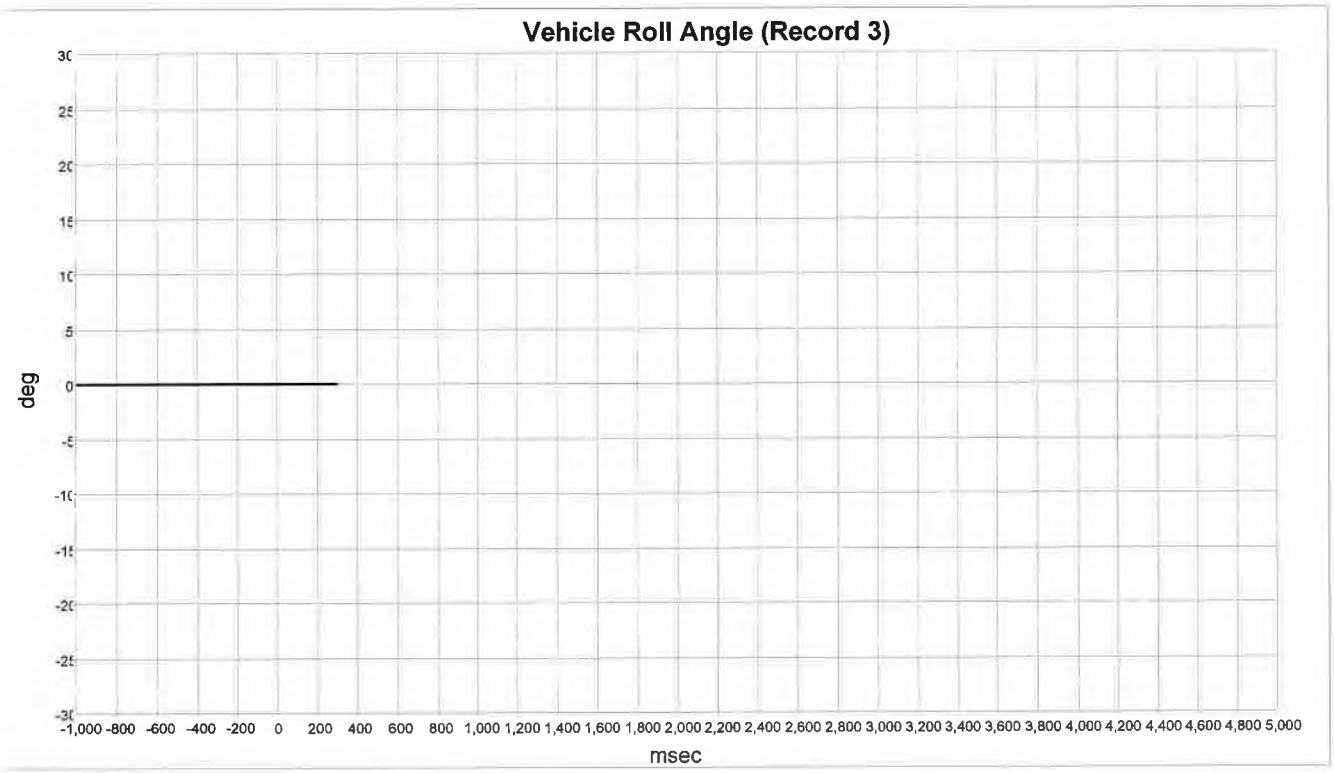
CDR CRASH DATA RETRIEVAL

Normal Acceleration (Record 3)



Time (msec)	Normal Acceleration (g)
0	0.0
10	0.0
20	0.0
30	0.0
40	0.0
50	0.0
60	0.0
70	0.0
80	0.0
90	0.0
100	0.0
110	0.0
120	0.0
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Angle (Record 3)



Time (msec)	Vehicle Roll Angle (deg)
-1000	0
-900	0
-800	0
-700	0
-600	0
-500	0
-400	0
-300	0
-200	0
-100	0
0	0
100	0
200	0
300	0
400	Data Not Available
500	Data Not Available
600	Data Not Available
700	Data Not Available
800	Data Not Available
900	Data Not Available
1000	Data Not Available
1100	Data Not Available
1200	Data Not Available
1300	Data Not Available
1400	Data Not Available
1500	Data Not Available
1600	Data Not Available

[redacted]

CDR CRASH DATA RETRIEVAL

Time (msec)	Vehicle Roll Angle (deg)
1700	Data Not Available
1800	Data Not Available
1900	Data Not Available
2000	Data Not Available
2100	Data Not Available
2200	Data Not Available
2300	Data Not Available
2400	Data Not Available
2500	Data Not Available
2600	Data Not Available
2700	Data Not Available
2800	Data Not Available
2900	Data Not Available
3000	Data Not Available
3100	Data Not Available
3200	Data Not Available
3300	Data Not Available
3400	Data Not Available
3500	Data Not Available
3600	Data Not Available
3700	Data Not Available
3800	Data Not Available
3900	Data Not Available
4000	Data Not Available
4100	Data Not Available
4200	Data Not Available
4300	Data Not Available
4400	Data Not Available
4500	Data Not Available
4600	Data Not Available
4700	Data Not Available
4800	Data Not Available
4900	Data Not Available
5000	Data Not Available

CRASH DATA RETRIEVAL

System Status at Event (Record 4)

Event Counter at Event (Counts)	10
Event Type	Frontal
Multi-Event, Number of Events	1, Event
Time from Initial Event to Current Event (msec)	0.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2019-05-07, 11:31:30
Vehicle Mileage (km)	18,580
Operating Time (min)	30,475
Ignition Cycle at Event (Cycles)	1,656
Ignition Cycle at Download (Cycles)	1,661
Maximum Delta-V, Longitudinal (MPH [km/h])	-28.0 [-45]
Time, Maximum Delta-V, Longitudinal (msec)	300.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	-13.7 [-22]
Time, Maximum Delta-V, Lateral (msec)	77.5
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	300.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	357
Time from Time Zero to Algorithm Start (Front) (msec)	Algorithm Started at Time Zero
Time from Time Zero to Algorithm Reset (Front) (msec)	144
Time from Time Zero to Algorithm Start (Side) (msec)	2
Time from Time Zero to Algorithm Reset (Side) (msec)	103
Time from Time Zero to Algorithm Start (Rear) (msec)	8
Time from Time Zero to Algorithm Reset (Rear) (msec)	98
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset
Vehicle Identification Number (VIN)	WVWZZZAUZJW******
Part Number, ACM	5Q0959655BH
Supplier ID, ACM	TSR
Production Date, ACM	180411
Supply Voltage (Before Event) (V)	14.2
Complete File Recorded	Completed Successfully

[redacted]

CDR CRASH DATA RETRIEVAL

Deployment Command Data (Record 4)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	6
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	6
Knee Airbag, Time to Deployment, Driver (msec)	6
Side Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	17
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	6
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	6
Side Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	17

Pre-Crash Data -1 Sec (Record 4)

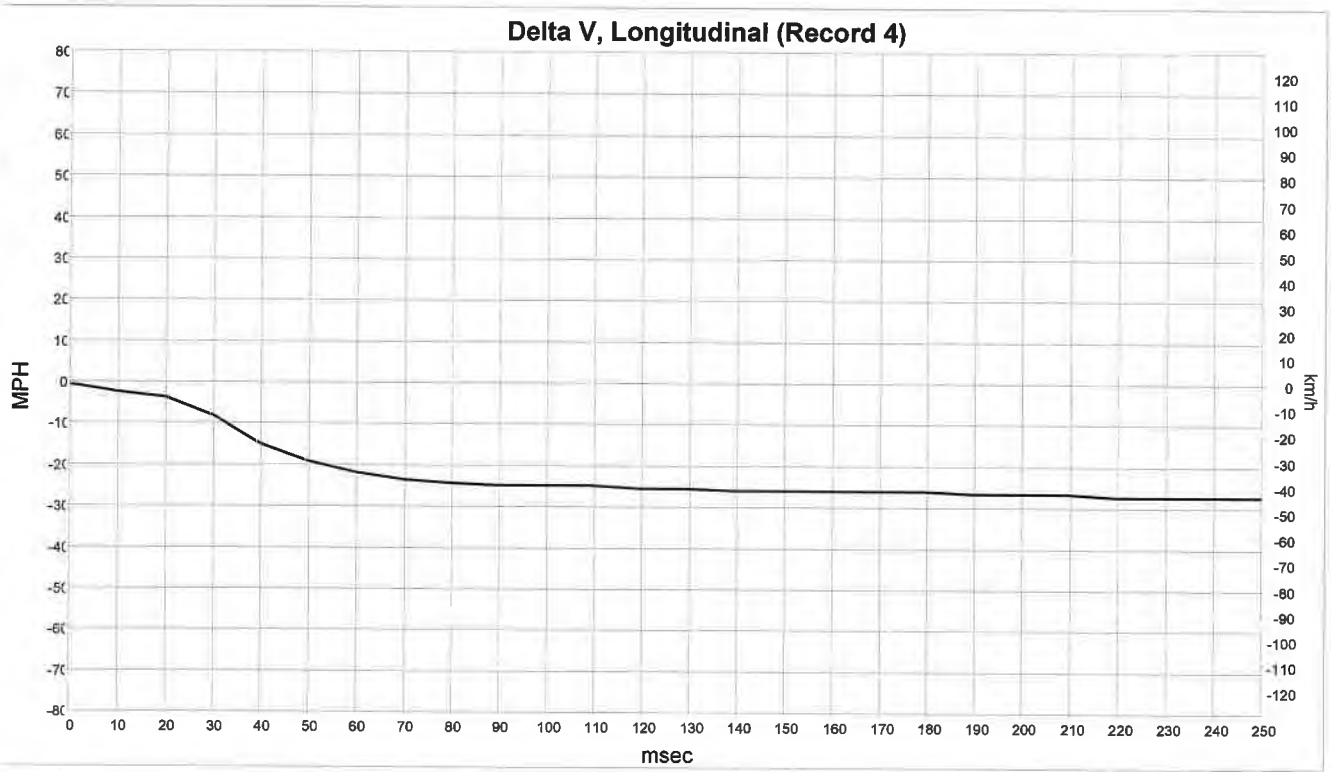
Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Not Belted
Frontal Airbag Disable Indicator Status, Passenger	Off
Airbag Warning Lamp, Status	Off
Frontal Airbag Suppression Switch Status, Front Passenger	Not Suppressed

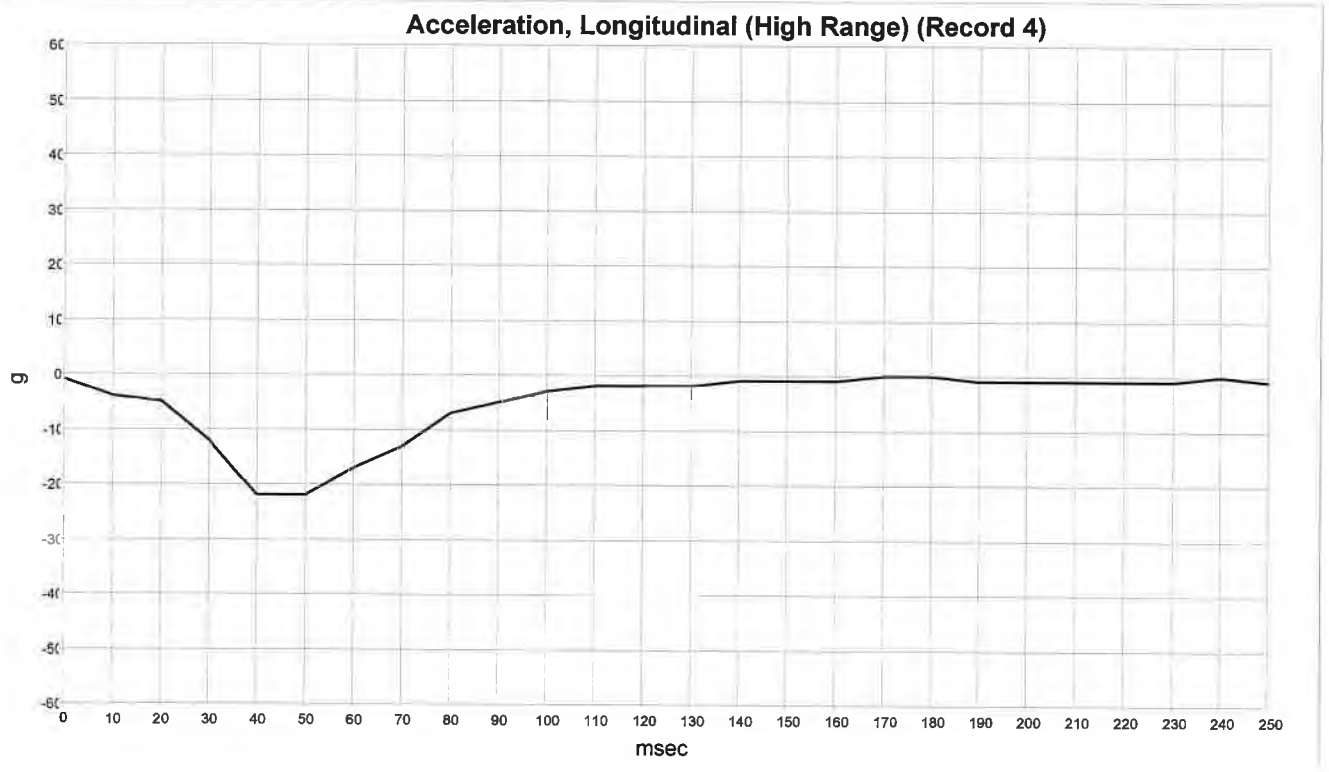
Pre-Crash Data -5 to 0 sec (Record 4)

Time (sec)	Engine RPM (Combustion Engine) (RPM)	ABS Activity	Stability Control	Steering Input (deg)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	4416	No ABS Activity	No ESC Activity	0	97 [156]	0	Off
-4.5	4416	No ABS Activity	No ESC Activity	0	96 [154]	0	Off
-4.0	4352	No ABS Activity	No ESC Activity	0	94 [152]	0	Off
-3.5	4288	No ABS Activity	No ESC Activity	0	93 [150]	0	Off
-3.0	4160	No ABS Activity	No ESC Activity	0	91 [147]	0	On (Driver)
-2.5	3968	No ABS Activity	No ESC Activity	0	87 [140]	0	On (Driver)
-2.0	3456	No ABS Activity	No ESC Activity	0	83 [134]	0	On (Driver)
-1.5	2880	No ABS Activity	No ESC Activity	0	80 [128]	0	On (Driver)
-1.0	2496	No ABS Activity	No ESC Activity	12	71 [115]	0	On (Driver)
-0.5	2112	ABS Activity	No ESC Activity	20	57 [91]	0	On (Driver)
0.0	1600	ABS Activity	ESC Activity	198	43 [70]	0	On (Driver)

CRASH DATA RETRIEVAL

Longitudinal Crash Pulse (Record 4)



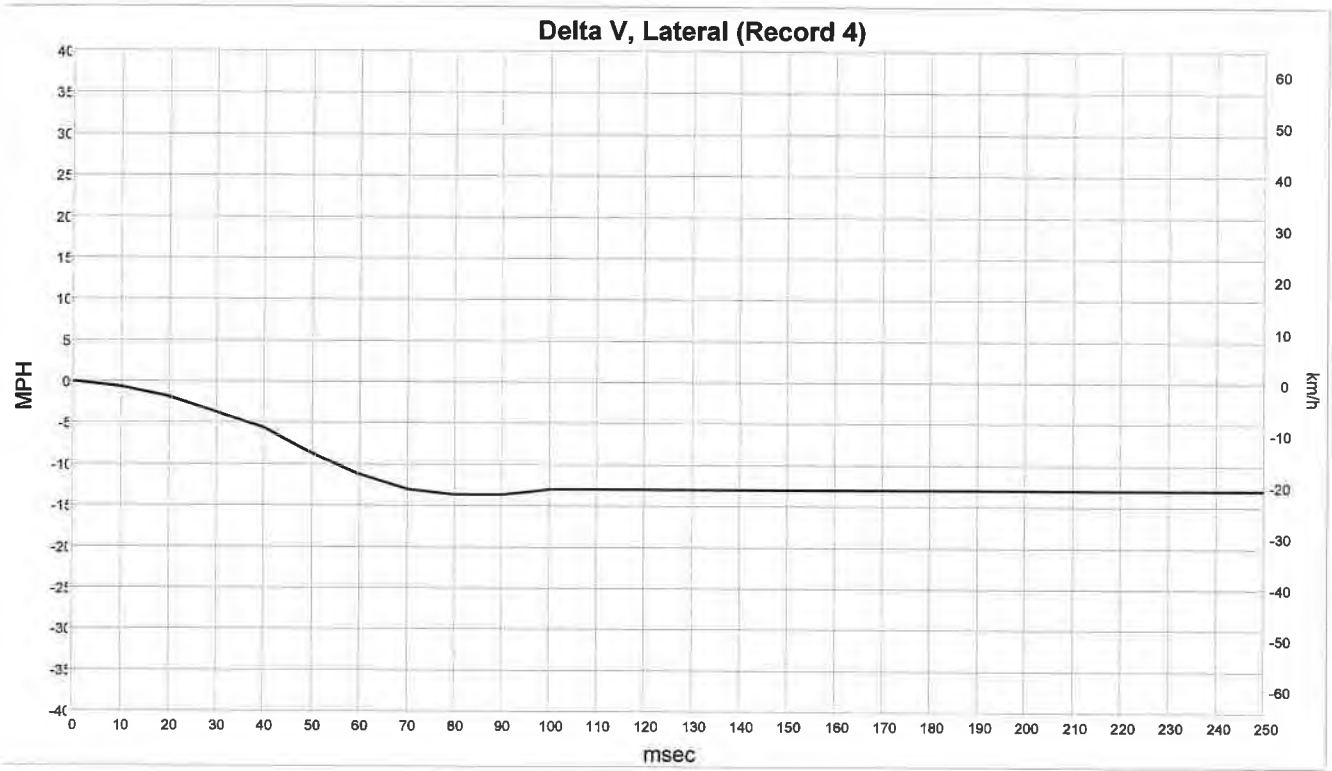


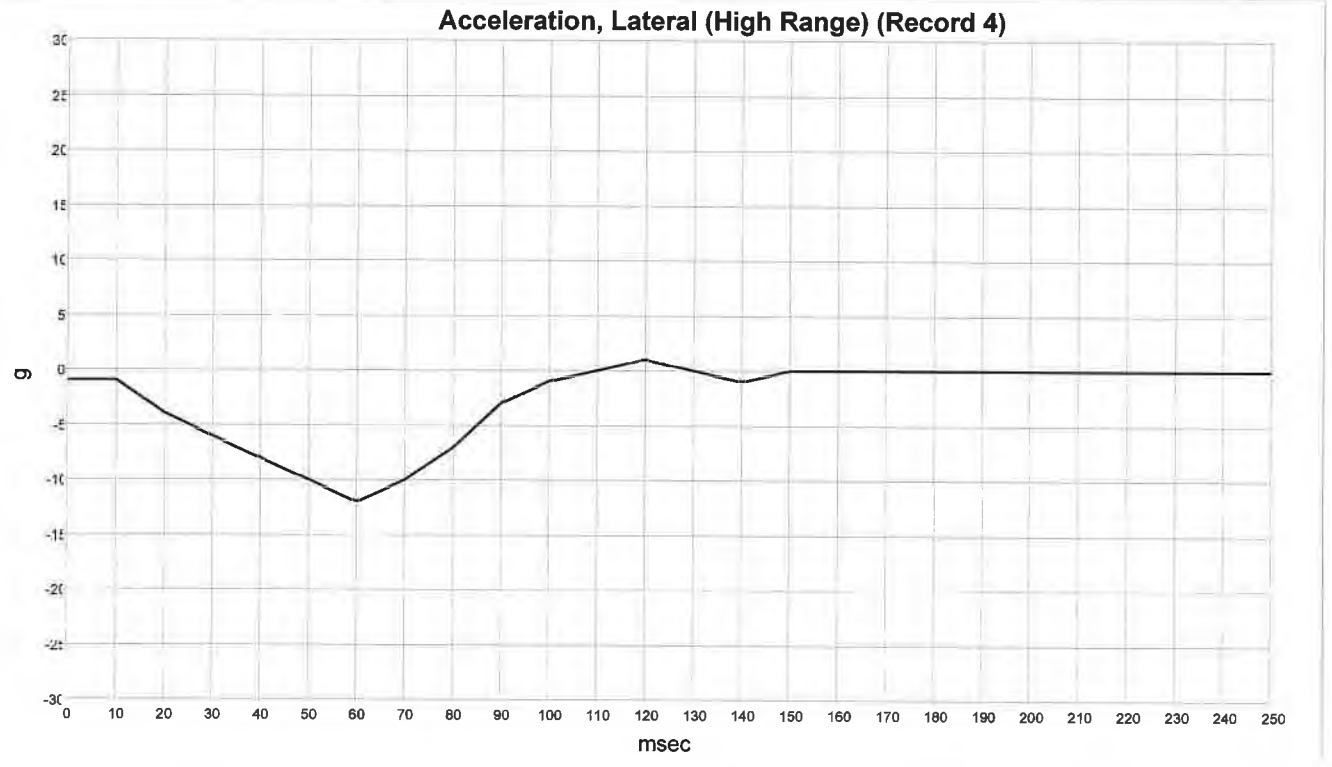
Longitudinal Crash Pulse (Record 4)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	-0.6 [-1]	-1.02
10	-2.5 [-4]	-3.77
20	-3.7 [-6]	-5.48
30	-8.1 [-13]	-12.33
40	-14.9 [-24]	-21.61
50	-19.3 [-31]	-21.59
60	-21.7 [-35]	-16.60
70	-23.6 [-38]	-12.73
80	-24.2 [-39]	-6.81
90	-24.9 [-40]	-5.35
100	-24.9 [-40]	-3.33
110	-24.9 [-40]	-2.13
120	-25.5 [-41]	-1.71
130	-25.5 [-41]	-1.86
140	-26.1 [-42]	-1.49
150	-26.1 [-42]	-1.41
160	-26.1 [-42]	-0.91
170	-26.1 [-42]	-0.44
180	-26.1 [-42]	-0.47
190	-26.7 [-43]	-0.58
200	-26.7 [-43]	-0.85
210	-26.7 [-43]	-1.05
220	-27.3 [-44]	-0.84
230	-27.3 [-44]	-0.56
240	-27.3 [-44]	-0.38
250	-27.3 [-44]	-0.50

CRASH DATA RETRIEVAL

Lateral Crash Pulse (Record 4)

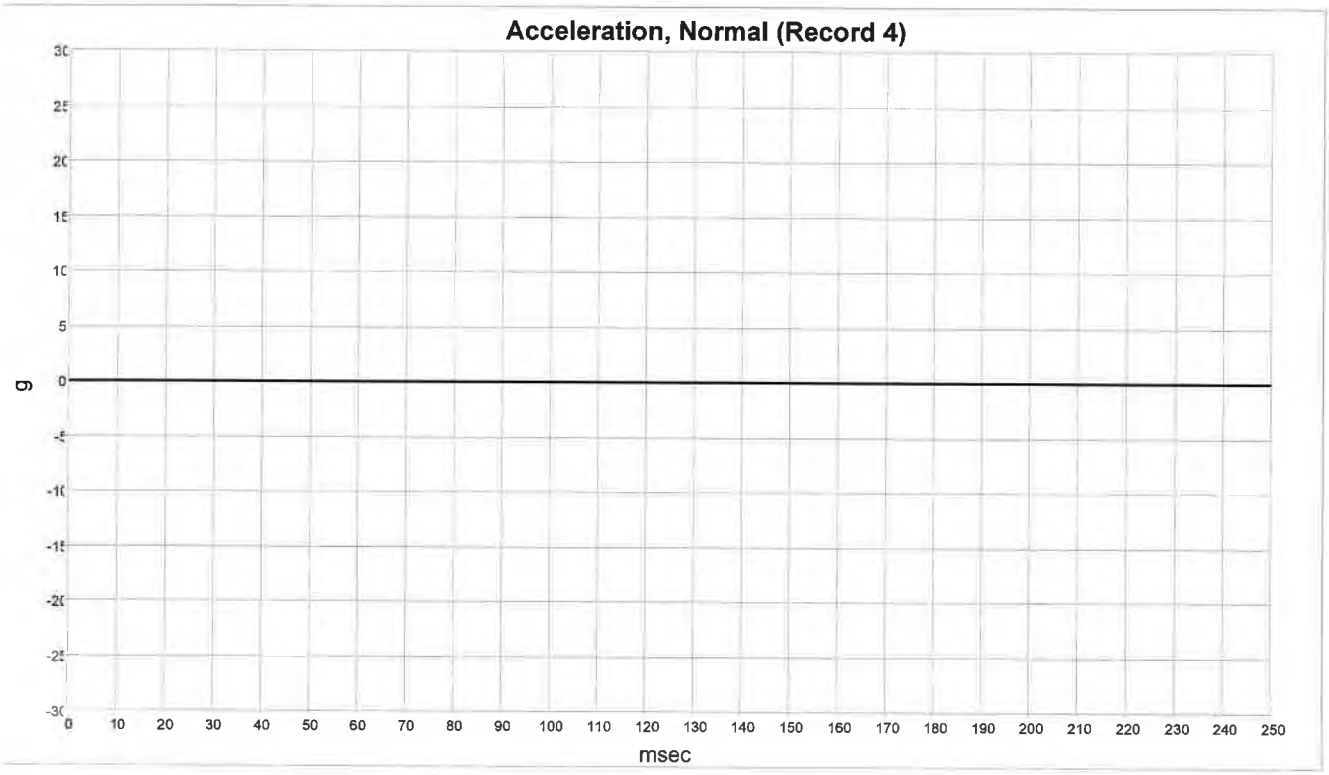




Lateral Crash Pulse (Record 4)

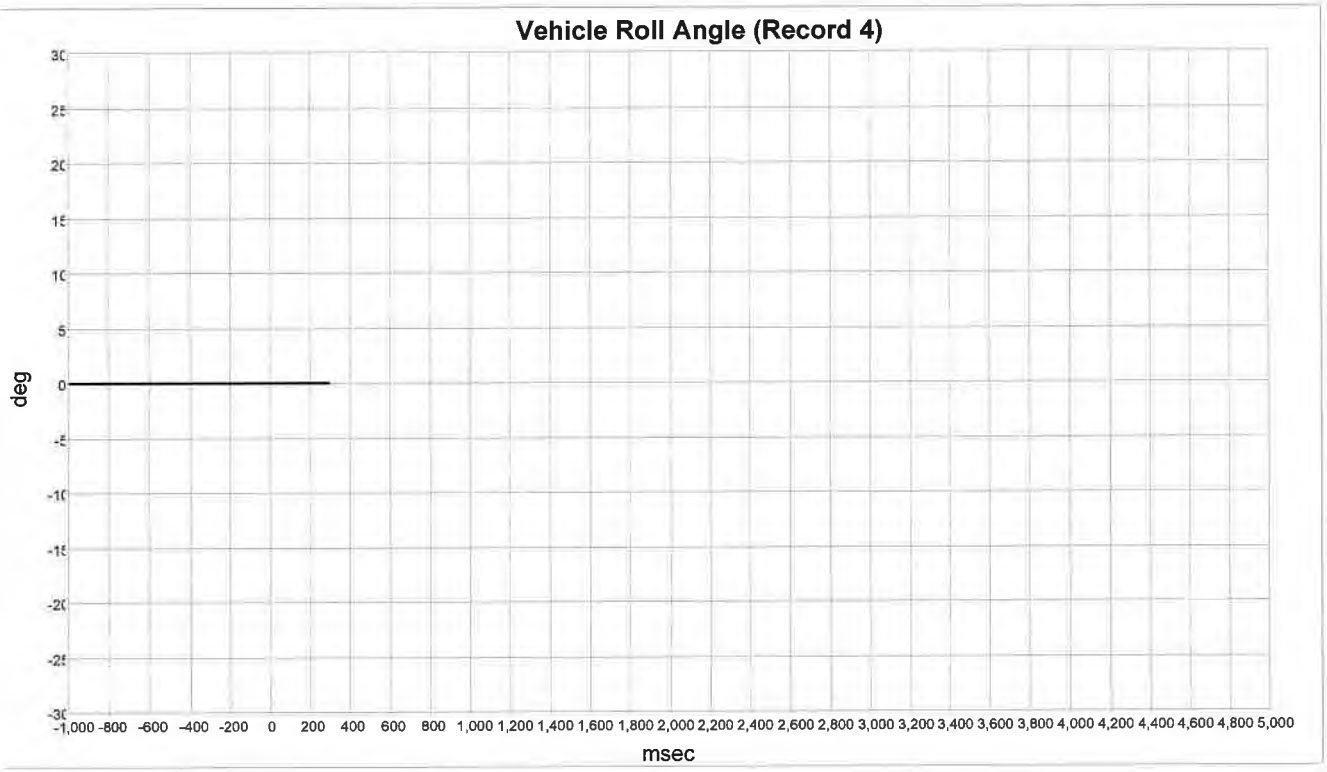
Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	-1.27
10	-0.6 [-1]	-1.37
20	-1.9 [-3]	-4.13
30	-3.7 [-6]	-6.32
40	-5.6 [-9]	-8.45
50	-8.7 [-14]	-10.27
60	-11.2 [-18]	-11.78
70	-13.0 [-21]	-9.77
80	-13.7 [-22]	-6.72
90	-13.7 [-22]	-2.96
100	-13.0 [-21]	-0.90
110	-13.0 [-21]	-0.10
120	-13.0 [-21]	0.66
130	-13.0 [-21]	0.27
140	-13.0 [-21]	-0.52
150	-13.0 [-21]	-0.34
160	-13.0 [-21]	-0.16
170	-13.0 [-21]	0.05
180	-13.0 [-21]	0.16
190	-13.0 [-21]	0.13
200	-13.0 [-21]	0.16
210	-13.0 [-21]	0.02
220	-13.0 [-21]	-0.17
230	-13.0 [-21]	-0.27
240	-13.0 [-21]	-0.16
250	-13.0 [-21]	-0.09

Normal Acceleration (Record 4)



Time (msec)	Normal Acceleration (g)
0	0.0
10	0.0
20	0.0
30	0.0
40	0.0
50	0.0
60	0.0
70	0.0
80	0.0
90	0.0
100	0.0
110	0.0
120	0.0
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Angle (Record 4)



Time (msec)	Vehicle Roll Angle (deg)
-1000	0
-900	0
-800	0
-700	0
-600	0
-500	0
-400	0
-300	0
-200	0
-100	0
0	0
100	0
200	0
300	0
400	Data Not Available
500	Data Not Available
600	Data Not Available
700	Data Not Available
800	Data Not Available
900	Data Not Available
1000	Data Not Available
1100	Data Not Available
1200	Data Not Available
1300	Data Not Available
1400	Data Not Available
1500	Data Not Available
1600	Data Not Available

Time (msec)	Vehicle Roll Angle (deg)
1700	Data Not Available
1800	Data Not Available
1900	Data Not Available
2000	Data Not Available
2100	Data Not Available
2200	Data Not Available
2300	Data Not Available
2400	Data Not Available
2500	Data Not Available
2600	Data Not Available
2700	Data Not Available
2800	Data Not Available
2900	Data Not Available
3000	Data Not Available
3100	Data Not Available
3200	Data Not Available
3300	Data Not Available
3400	Data Not Available
3500	Data Not Available
3600	Data Not Available
3700	Data Not Available
3800	Data Not Available
3900	Data Not Available
4000	Data Not Available
4100	Data Not Available
4200	Data Not Available
4300	Data Not Available
4400	Data Not Available
4500	Data Not Available
4600	Data Not Available
4700	Data Not Available
4800	Data Not Available
4900	Data Not Available
5000	Data Not Available

System Status at Event (Record 5)

Event Counter at Event (Counts)	9
Event Type	External Trigger
Multi-Event, Number of Events	1. Event
Time from Initial Event to Current Event (msec)	0.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2019-04-28, 14:06:19
Vehicle Mileage (km)	17,840
Operating Time (min)	29,462
Ignition Cycle at Event (Cycles)	1,607
Ignition Cycle at Download (Cycles)	1,661
Maximum Delta-V, Longitudinal (MPH [km/h])	0.0 [0]
Time, Maximum Delta-V, Longitudinal (msec)	210.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	0.0 [0]
Time, Maximum Delta-V, Lateral (msec)	0.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	210.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	66
Time from Time Zero to Algorithm Start (Front) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Front) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Side) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Side) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Rear) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rear) (msec)	Algorithm Not Reset
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset
Vehicle Identification Number (VIN)	WVWZZZAUZJW******
Part Number, ACM	5Q0959655BH
Supplier ID, ACM	TSR
Production Date, ACM	180411
Supply Voltage (Before Event) (V)	13.8
Complete File Recorded	Completed Successfully

CDR CRASH DATA RETRIEVAL

Deployment Command Data (Record 5)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Knee Airbag, Time to Deployment, Driver (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	Not Deployed
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	Not Deployed

[redacted]

CDR CRASH DATA RETRIEVAL

Pre-Crash Data -1 Sec (Record 5)

Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Belted
Frontal Airbag Disable Indicator Status, Passenger	Off
Airbag Warning Lamp, Status	Off
Frontal Airbag Suppression Switch Status, Front Passenger	Not Suppressed

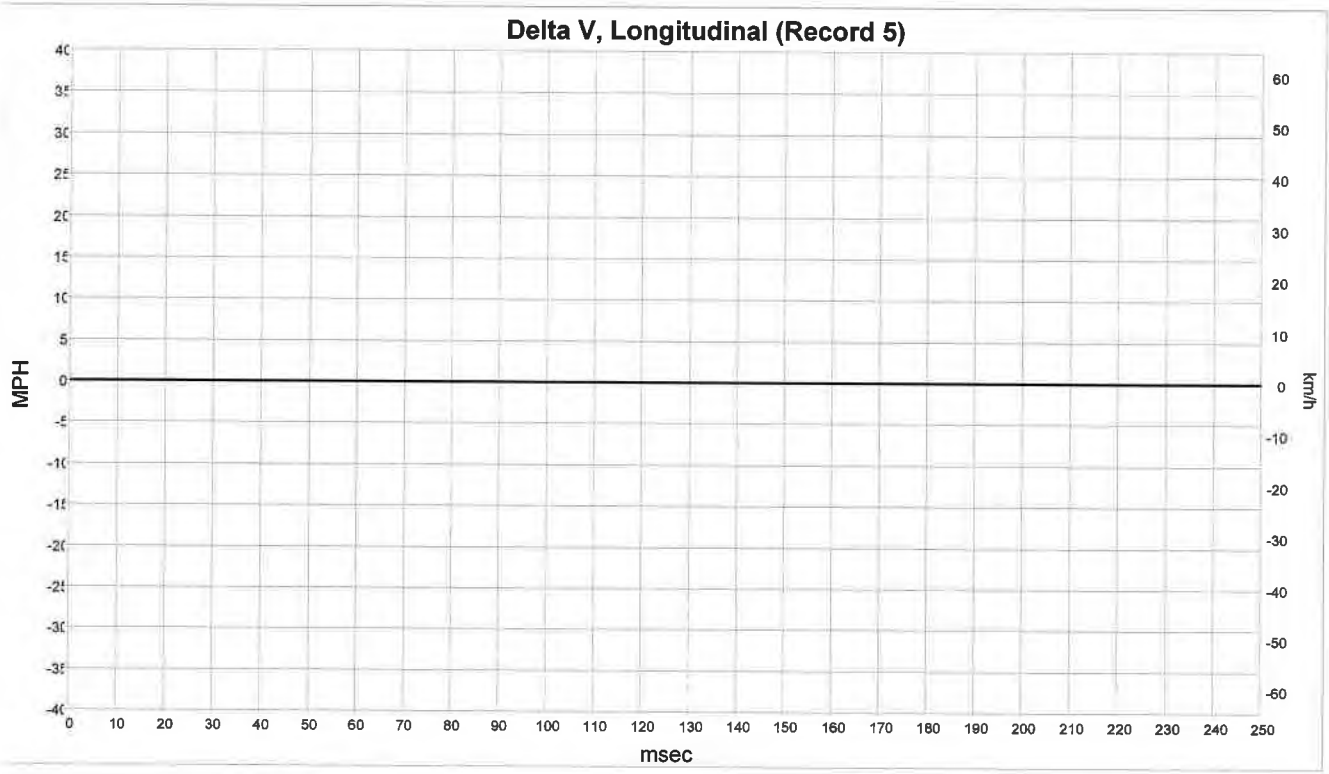
Pre-Crash Data -5 to 0 sec (Record 5)

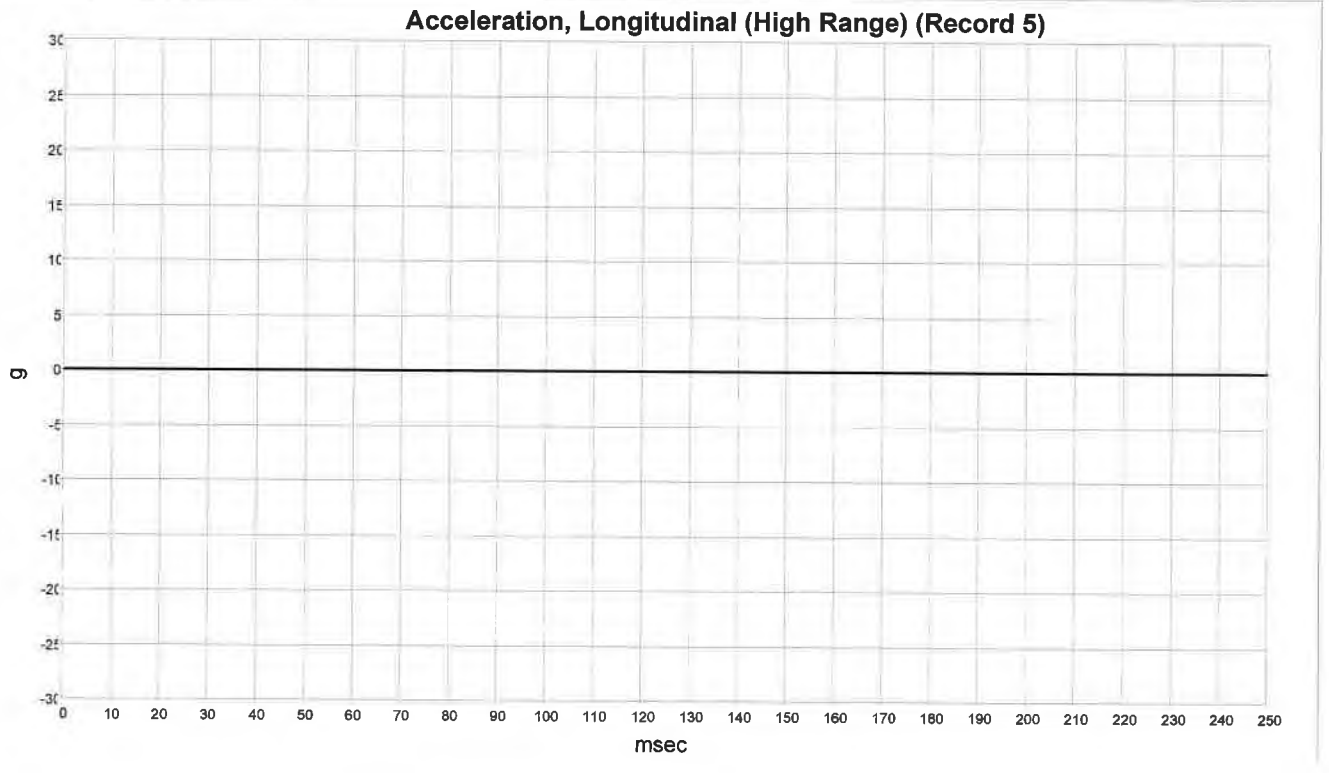
Time (sec)	Engine RPM (Combustion Engine) (RPM)	ABS Activity	Stability Control	Steering Input (deg)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	1152	No ABS Activity	No ESC Activity	0	42 [68]	0	On (Driver)
-4.5	1152	No ABS Activity	No ESC Activity	-2	41 [66]	0	On (Driver)
-4.0	1088	No ABS Activity	No ESC Activity	-2	40 [65]	0	On (Driver)
-3.5	1088	No ABS Activity	No ESC Activity	0	40 [64]	0	On (Driver)
-3.0	1344	No ABS Activity	No ESC Activity	0	39 [62]	0	On (Driver)
-2.5	1344	No ABS Activity	No ESC Activity	0	37 [59]	0	On (Driver)
-2.0	1216	No ABS Activity	No ESC Activity	2	34 [54]	0	On (Driver)
-1.5	1088	No ABS Activity	No ESC Activity	6	30 [48]	0	On (Driver)
-1.0	1216	No ABS Activity	No ESC Activity	16	28 [45]	0	On (Driver)
-0.5	1024	No ABS Activity	No ESC Activity	24	23 [37]	0	On (Driver)
0.0	832	No ABS Activity	No ESC Activity	36	15 [24]	0	On (Driver)

[redacted]

CDR CRASH DATA RETRIEVAL

Longitudinal Crash Pulse (Record 5)



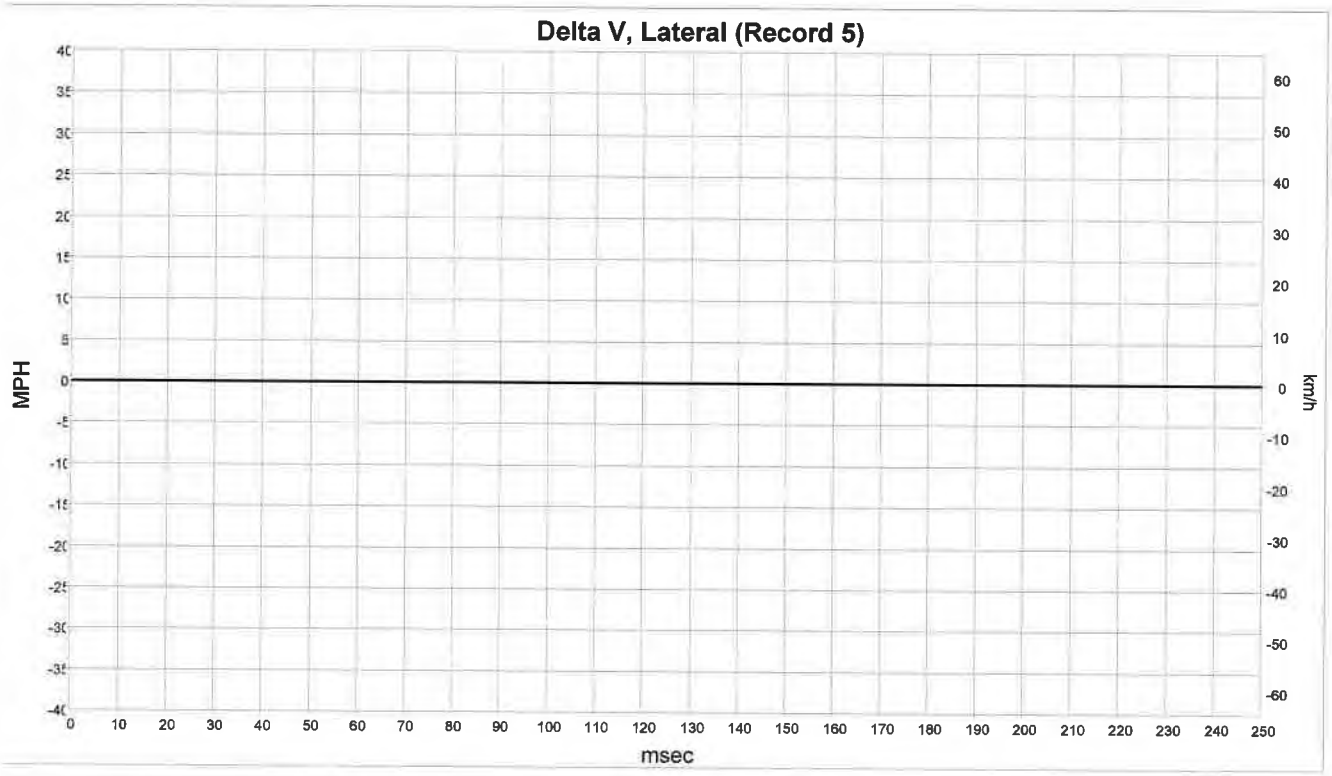


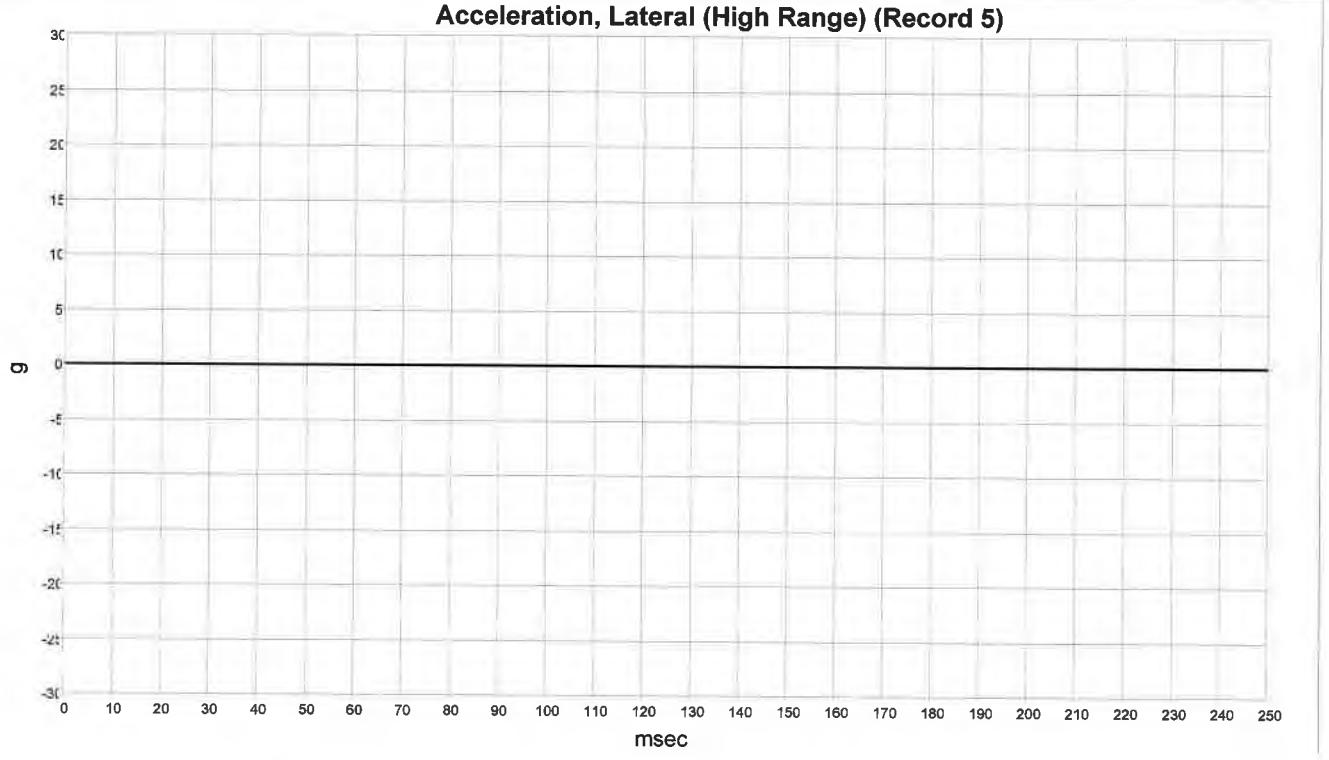
Longitudinal Crash Pulse (Record 5)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	0.0 [0]	0.01
10	0.0 [0]	0.01
20	0.0 [0]	0.02
30	0.0 [0]	0.07
40	0.0 [0]	0.09
50	0.0 [0]	0.11
60	0.0 [0]	0.12
70	0.0 [0]	0.12
80	0.0 [0]	0.12
90	0.0 [0]	0.12
100	0.0 [0]	0.13
110	0.0 [0]	0.13
120	0.0 [0]	0.13
130	0.0 [0]	0.13
140	0.0 [0]	0.13
150	0.0 [0]	0.13
160	0.0 [0]	0.13
170	0.0 [0]	0.13
180	0.0 [0]	0.13
190	0.0 [0]	0.13
200	0.0 [0]	0.13
210	0.0 [0]	0.13
220	0.0 [0]	0.13
230	0.0 [0]	0.13
240	0.0 [0]	0.13
250	0.0 [0]	0.13

CRASH DATA RETRIEVAL

Lateral Crash Pulse (Record 5)



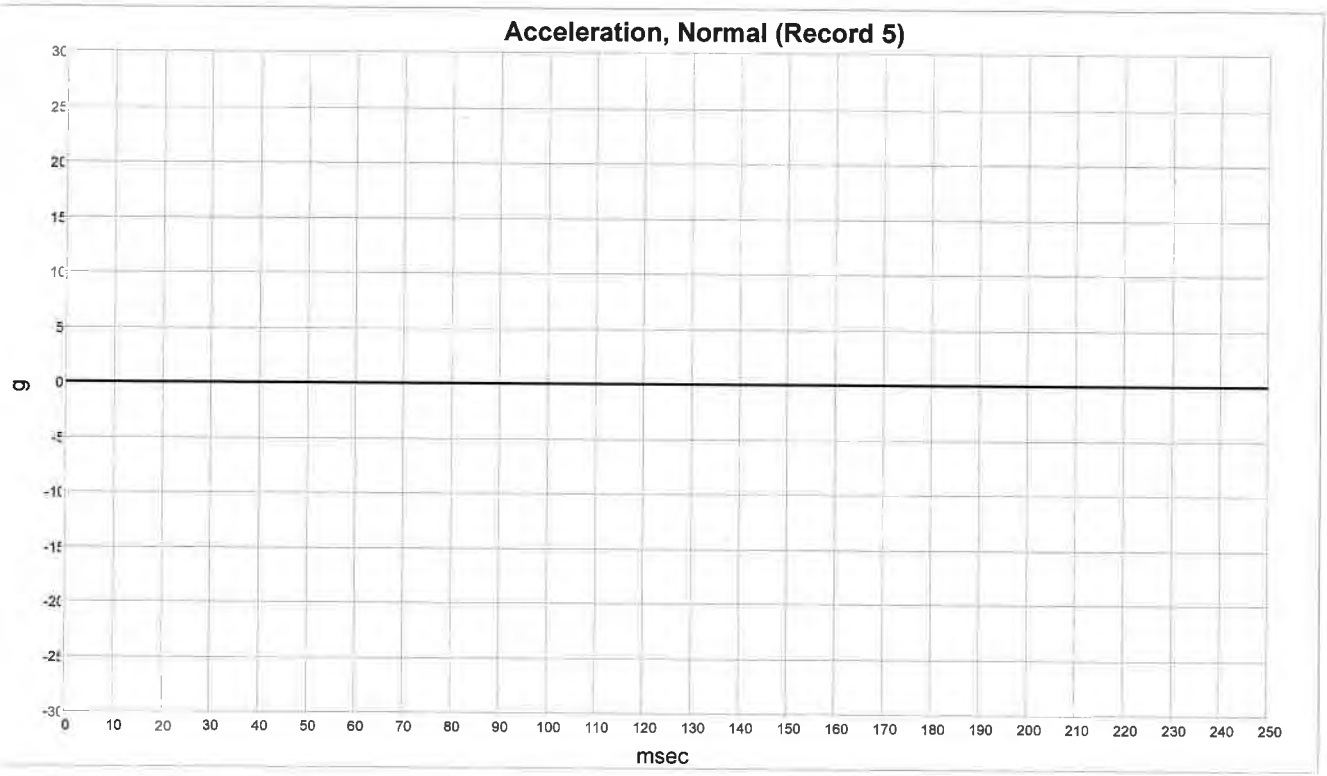


Lateral Crash Pulse (Record 5)

Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	0.03
10	0.0 [0]	0.03
20	0.0 [0]	0.03
30	0.0 [0]	0.03
40	0.0 [0]	0.03
50	0.0 [0]	0.03
60	0.0 [0]	0.03
70	0.0 [0]	0.03
80	0.0 [0]	0.03
90	0.0 [0]	0.03
100	0.0 [0]	0.03
110	0.0 [0]	0.03
120	0.0 [0]	0.03
130	0.0 [0]	0.03
140	0.0 [0]	0.03
150	0.0 [0]	0.03
160	0.0 [0]	0.03
170	0.0 [0]	0.03
180	0.0 [0]	0.03
190	0.0 [0]	0.03
200	0.0 [0]	0.03
210	0.0 [0]	0.03
220	0.0 [0]	0.03
230	0.0 [0]	0.03
240	0.0 [0]	0.03
250	0.0 [0]	0.03

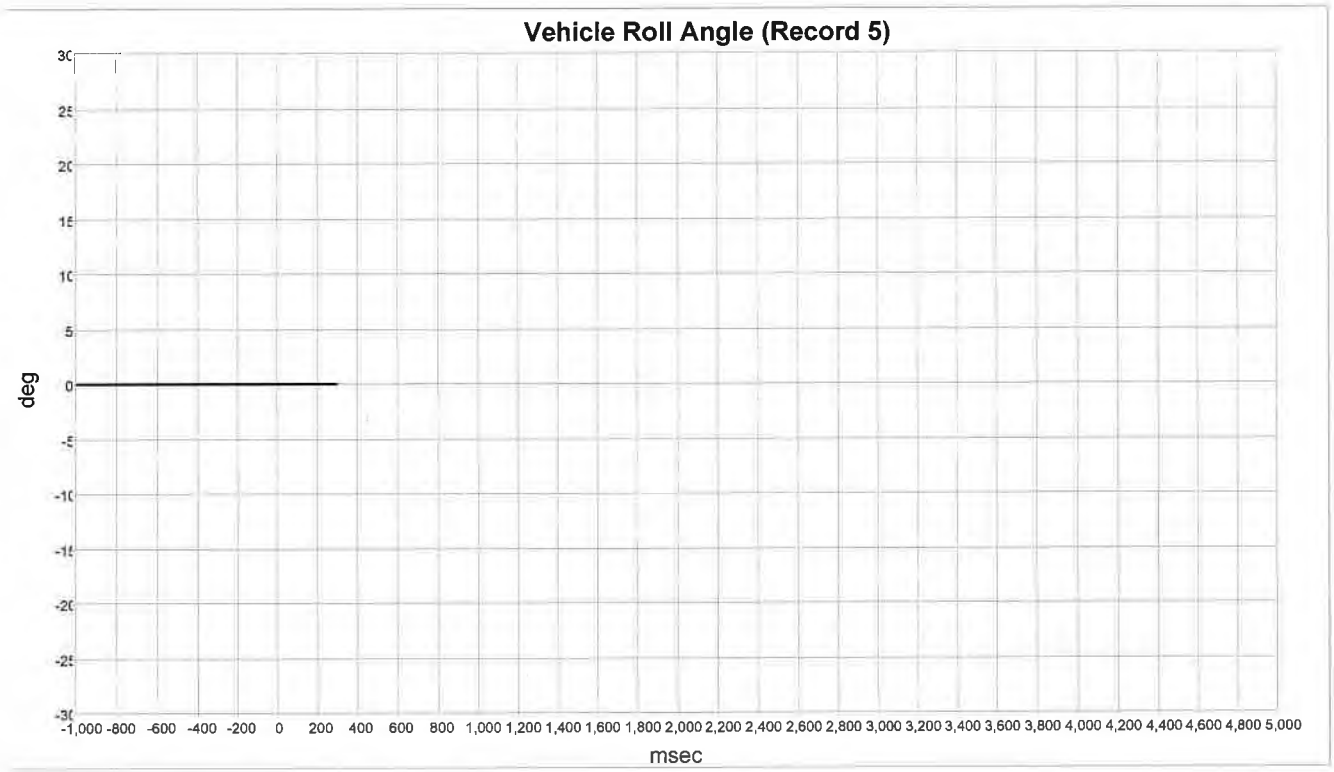
CDR CRASH DATA RETRIEVAL

Normal Acceleration (Record 5)



Time (msec)	Normal Acceleration (g)
0	0.0
10	0.0
20	0.0
30	0.0
40	0.0
50	0.0
60	0.0
70	0.0
80	0.0
90	0.0
100	0.0
110	0.0
120	0.0
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Angle (Record 5)



Time (msec)	Vehicle Roll Angle (deg)
-1000	0
-900	0
-800	0
-700	0
-600	0
-500	0
-400	0
-300	0
-200	0
-100	0
0	0
100	0
200	0
300	0
400	Data Not Available
500	Data Not Available
600	Data Not Available
700	Data Not Available
800	Data Not Available
900	Data Not Available
1000	Data Not Available
1100	Data Not Available
1200	Data Not Available
1300	Data Not Available
1400	Data Not Available
1500	Data Not Available
1600	Data Not Available

Time (msec)	Vehicle Roll Angle (deg)
1700	Data Not Available
1800	Data Not Available
1900	Data Not Available
2000	Data Not Available
2100	Data Not Available
2200	Data Not Available
2300	Data Not Available
2400	Data Not Available
2500	Data Not Available
2600	Data Not Available
2700	Data Not Available
2800	Data Not Available
2900	Data Not Available
3000	Data Not Available
3100	Data Not Available
3200	Data Not Available
3300	Data Not Available
3400	Data Not Available
3500	Data Not Available
3600	Data Not Available
3700	Data Not Available
3800	Data Not Available
3900	Data Not Available
4000	Data Not Available
4100	Data Not Available
4200	Data Not Available
4300	Data Not Available
4400	Data Not Available
4500	Data Not Available
4600	Data Not Available
4700	Data Not Available
4800	Data Not Available
4900	Data Not Available
5000	Data Not Available

CDR CRASH DATA RETRIEVAL

System Status at Event (Record 6)

Event Counter at Event (Counts)	8
Event Type	External Trigger
Multi-Event, Number of Events	1. Event
Time from Initial Event to Current Event (msec)	0.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2019-04-10, 17:44:50
Vehicle Mileage (km)	16.500
Operating Time (min)	27.364
Ignition Cycle at Event (Cycles)	1,506
Ignition Cycle at Download (Cycles)	1,661
Maximum Delta-V, Longitudinal (MPH [km/h])	-0.6 [-1]
Time, Maximum Delta-V, Longitudinal (msec)	105.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	0.0 [0]
Time, Maximum Delta-V, Lateral (msec)	0.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	105.0
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	253
Time from Time Zero to Algorithm Start (Front) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Front) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Side) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Side) (msec)	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Rear) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rear) (msec)	Algorithm Not Reset
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset
Vehicle Identification Number (VIN)	WVWZZZAUZJW******
Part Number, ACM	5Q0959655BH
Supplier ID, ACM	TSR
Production Date, ACM	180411
Supply Voltage (Before Event) (V)	14.3
Complete File Recorded	Completed Successfully

CRASH DATA RETRIEVAL

Deployment Command Data (Record 6)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Knee Airbag, Time to Deployment, Driver (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	Not Deployed
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	Not Deployed

Pre-Crash Data -1 Sec (Record 6)

Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Not Belted
Frontal Airbag Disable Indicator Status, Passenger	Off
Airbag Warning Lamp, Status	Off
Frontal Airbag Suppression Switch Status, Front Passenger	Not Suppressed

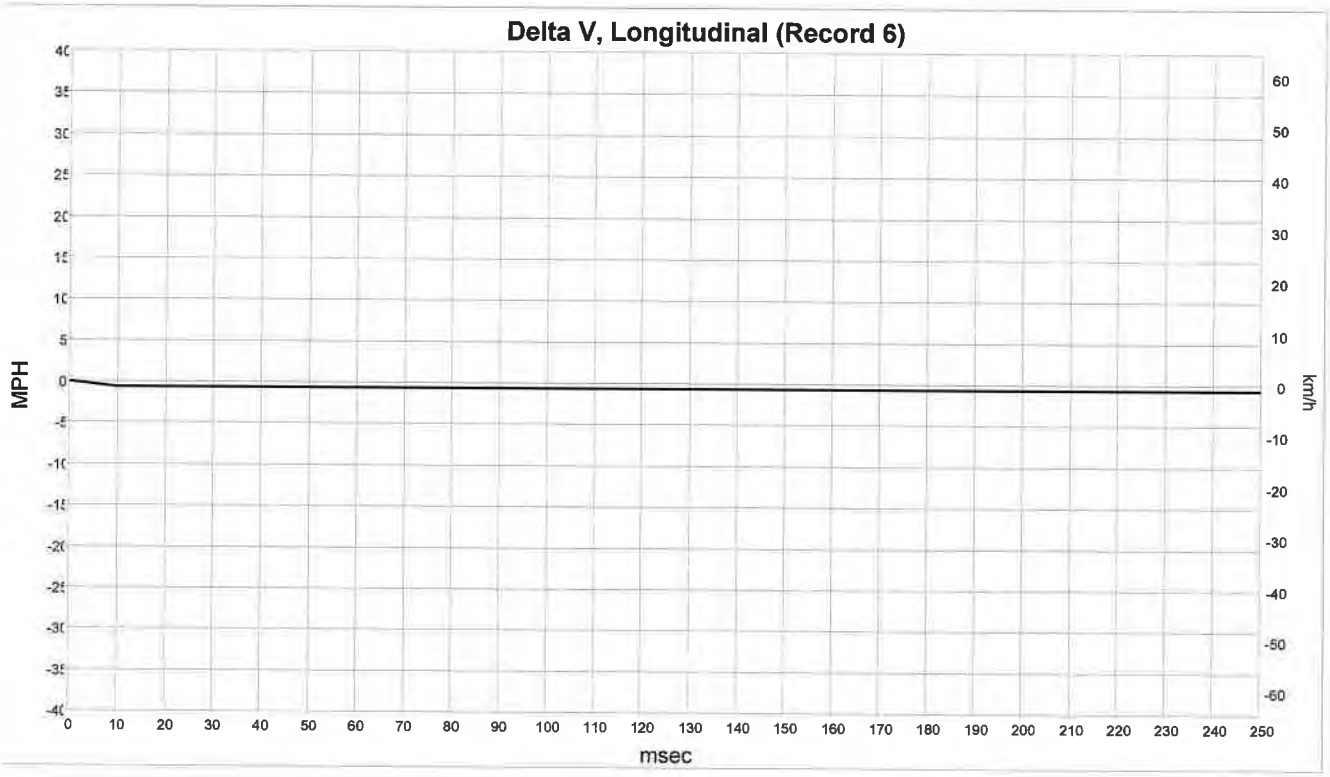
Pre-Crash Data -5 to 0 sec (Record 6)

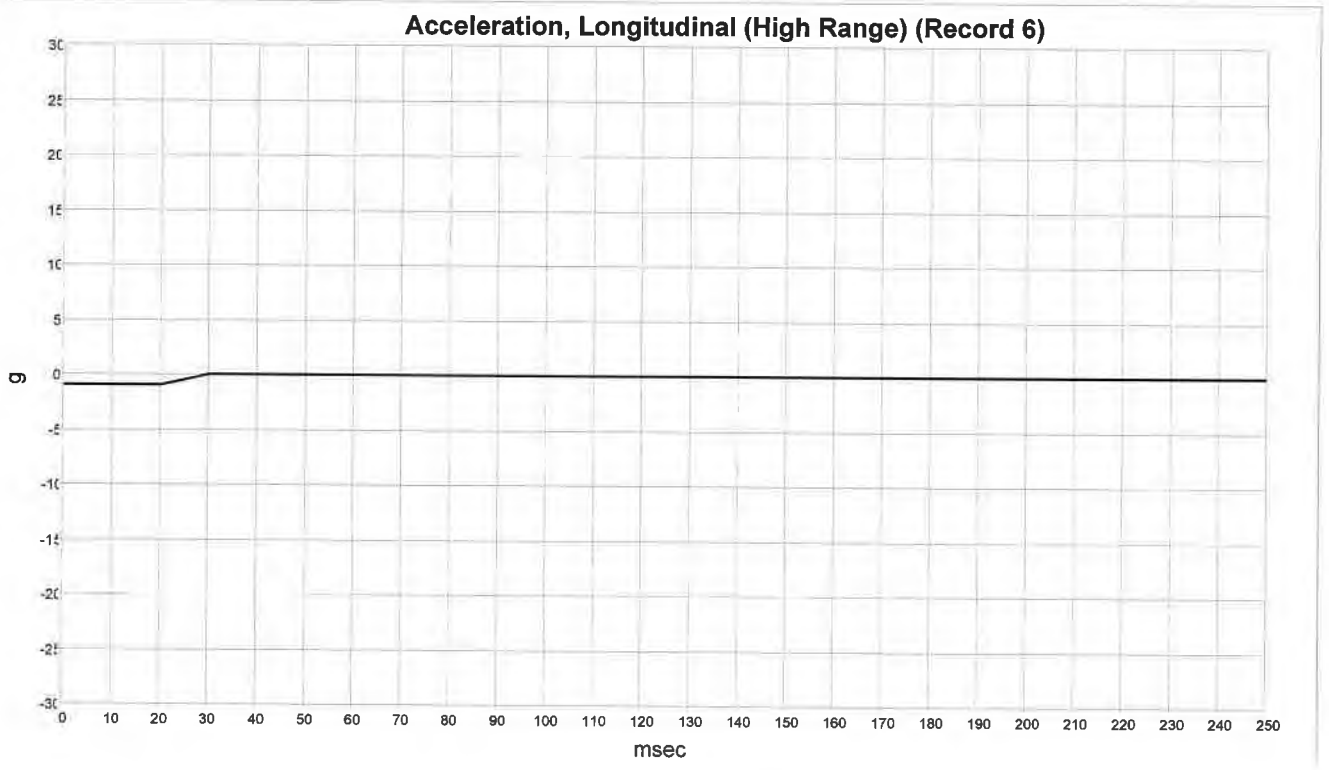
Time (sec)	Engine RPM (Combustion Engine) (RPM)	ABS Activity	Stability Control	Steering Input (deg)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	2368	No ABS Activity	No ESC Activity	-40	20 [32]	42	Off
-4.5	2624	No ABS Activity	No ESC Activity	-34	22 [35]	36	Off
-4.0	2752	No ABS Activity	No ESC Activity	-26	24 [38]	20	Off
-3.5	2816	No ABS Activity	No ESC Activity	-24	24 [38]	8	Off
-3.0	2816	No ABS Activity	No ESC Activity	-18	24 [38]	10	Off
-2.5	2176	No ABS Activity	No ESC Activity	-16	24 [38]	10	Off
-2.0	1984	No ABS Activity	No ESC Activity	-6	24 [39]	15	Off
-1.5	1984	No ABS Activity	No ESC Activity	-6	24 [39]	20	Off
-1.0	1984	No ABS Activity	No ESC Activity	-10	25 [40]	0	Off
-0.5	1856	No ABS Activity	No ESC Activity	-10	24 [38]	0	On (Driver)
0.0	1216	No ABS Activity	No ESC Activity	-10	16 [26]	0	On (Driver)

[redacted]

CDR CRASH DATA RETRIEVAL

Longitudinal Crash Pulse (Record 6)



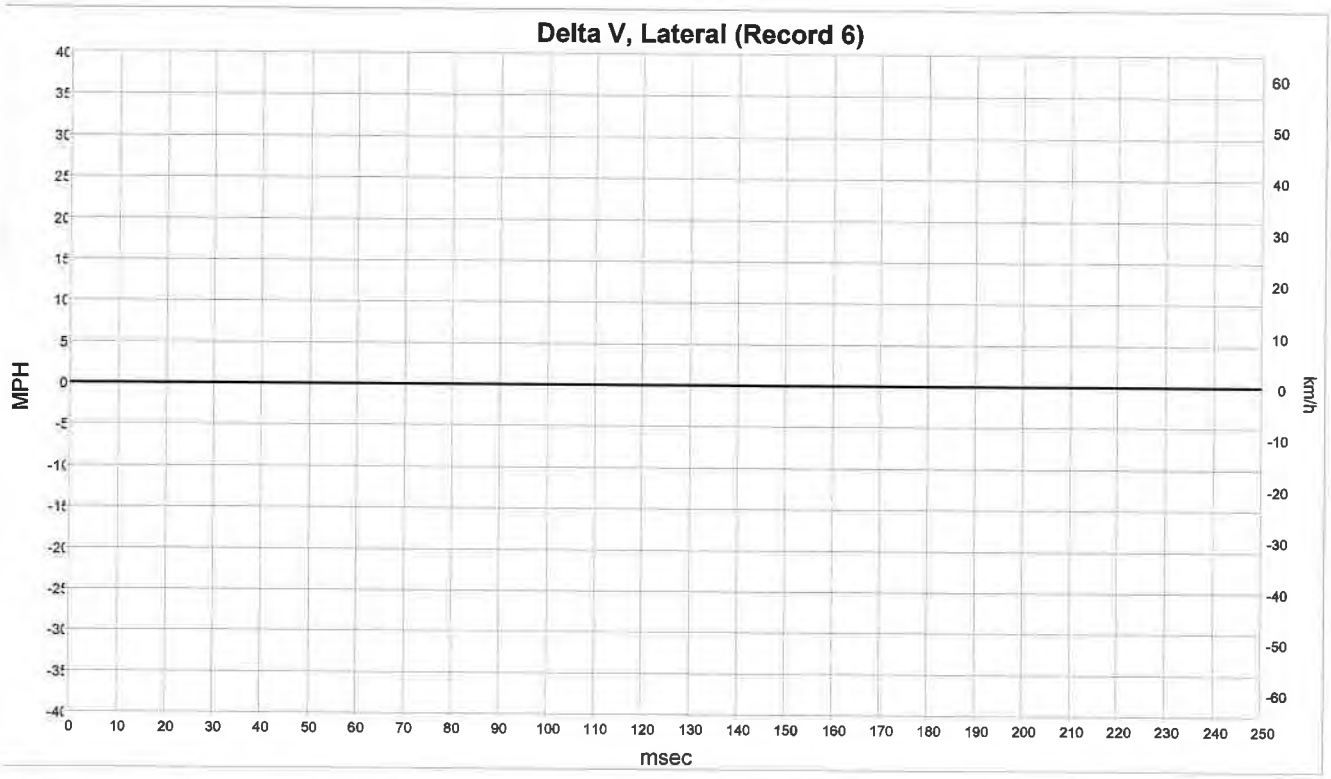


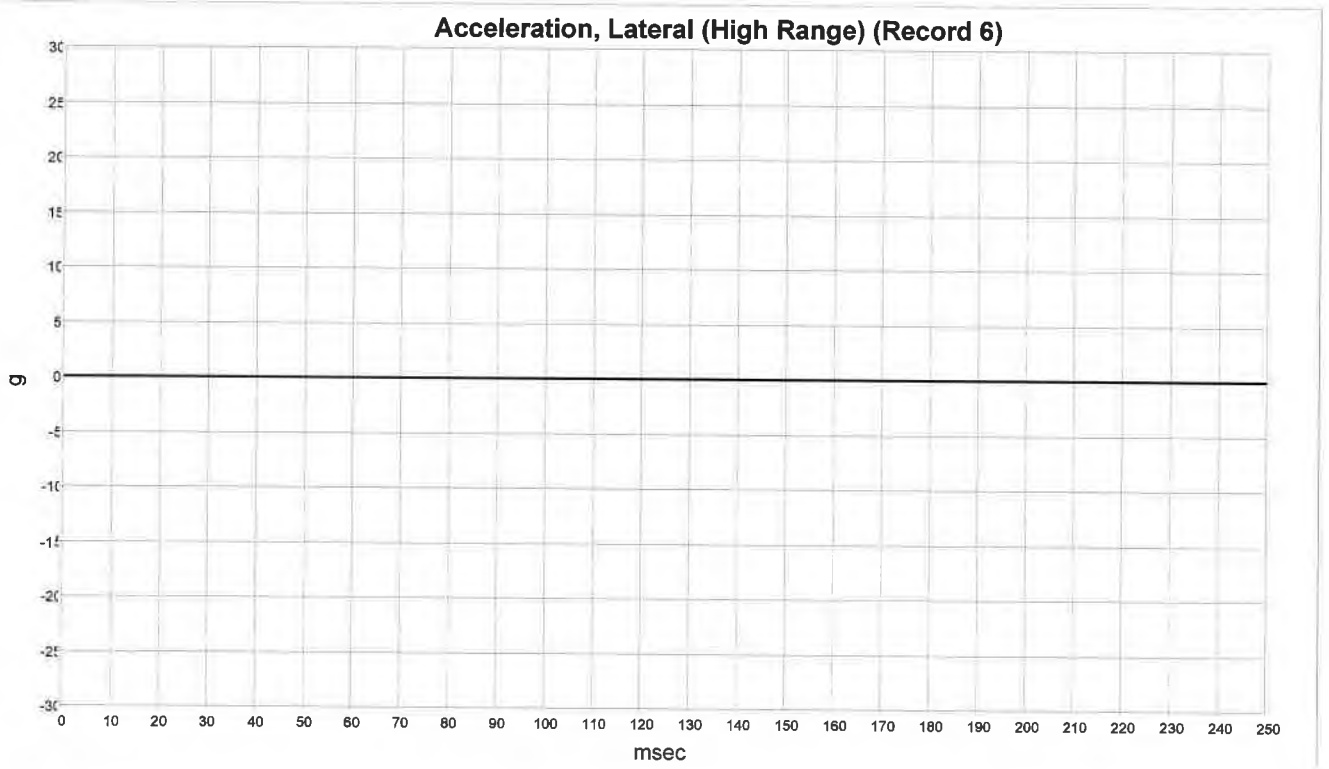
Longitudinal Crash Pulse (Record 6)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	0.0 [0]	-0.71
10	-0.6 [-1]	-0.63
20	-0.6 [-1]	-0.55
30	-0.6 [-1]	-0.49
40	-0.6 [-1]	-0.48
50	-0.6 [-1]	-0.48
60	-0.6 [-1]	-0.44
70	-0.6 [-1]	-0.39
80	-0.6 [-1]	-0.36
90	-0.6 [-1]	-0.34
100	-0.6 [-1]	-0.34
110	-0.6 [-1]	-0.30
120	-0.6 [-1]	-0.24
130	-0.6 [-1]	-0.23
140	-0.6 [-1]	-0.21
150	-0.6 [-1]	-0.21
160	-0.6 [-1]	-0.21
170	-0.6 [-1]	-0.19
180	-0.6 [-1]	-0.18
190	-0.6 [-1]	-0.18
200	-0.6 [-1]	-0.17
210	-0.6 [-1]	-0.14
220	-0.6 [-1]	-0.11
230	-0.6 [-1]	-0.05
240	-0.6 [-1]	-0.05
250	-0.6 [-1]	-0.05

CRASH DATA RETRIEVAL

Lateral Crash Pulse (Record 6)





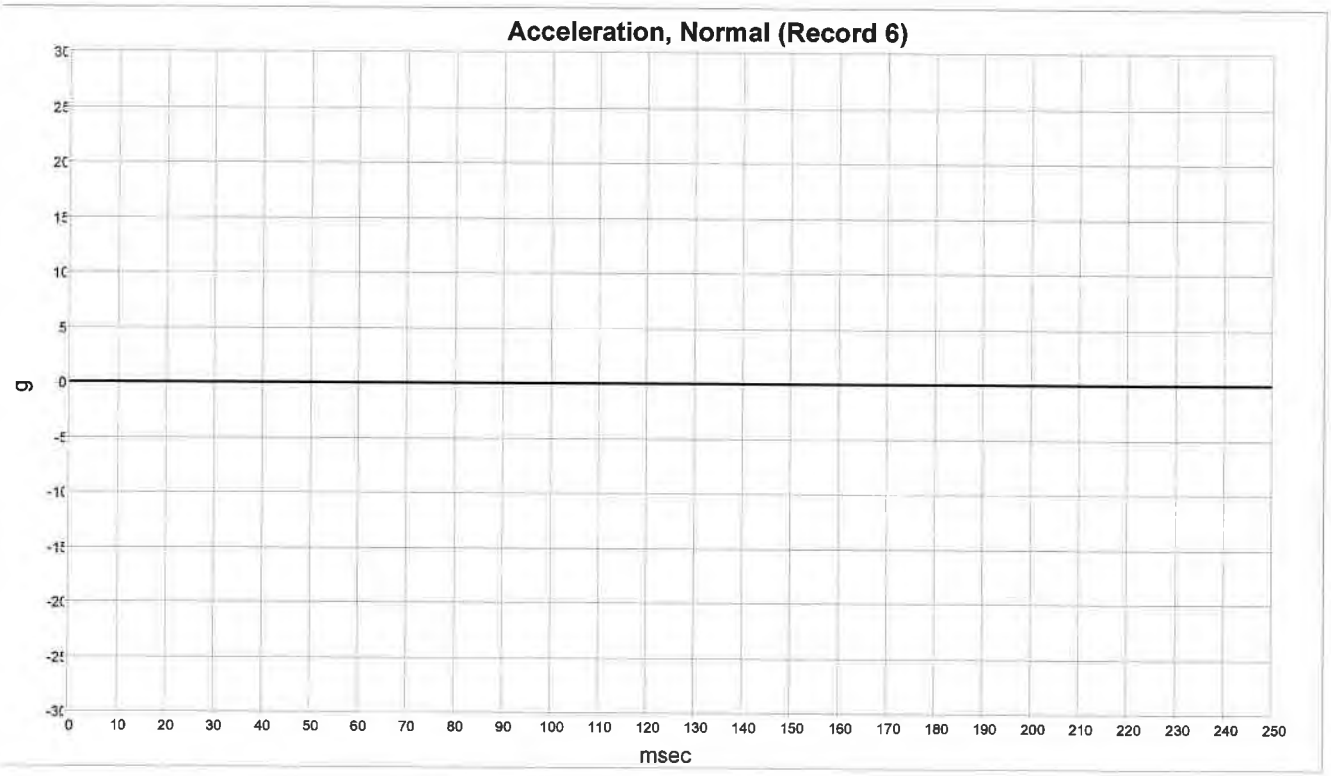
Lateral Crash Pulse (Record 6)

Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	-0.04
10	0.0 [0]	-0.04
20	0.0 [0]	-0.04
30	0.0 [0]	-0.04
40	0.0 [0]	-0.04
50	0.0 [0]	-0.04
60	0.0 [0]	-0.04
70	0.0 [0]	-0.04
80	0.0 [0]	-0.04
90	0.0 [0]	-0.04
100	0.0 [0]	-0.04
110	0.0 [0]	-0.04
120	0.0 [0]	-0.04
130	0.0 [0]	-0.04
140	0.0 [0]	-0.04
150	0.0 [0]	-0.04
160	0.0 [0]	-0.04
170	0.0 [0]	-0.04
180	0.0 [0]	-0.04
190	0.0 [0]	-0.04
200	0.0 [0]	-0.04
210	0.0 [0]	-0.04
220	0.0 [0]	-0.04
230	0.0 [0]	-0.04
240	0.0 [0]	-0.04
250	0.0 [0]	-0.04

[redacted]

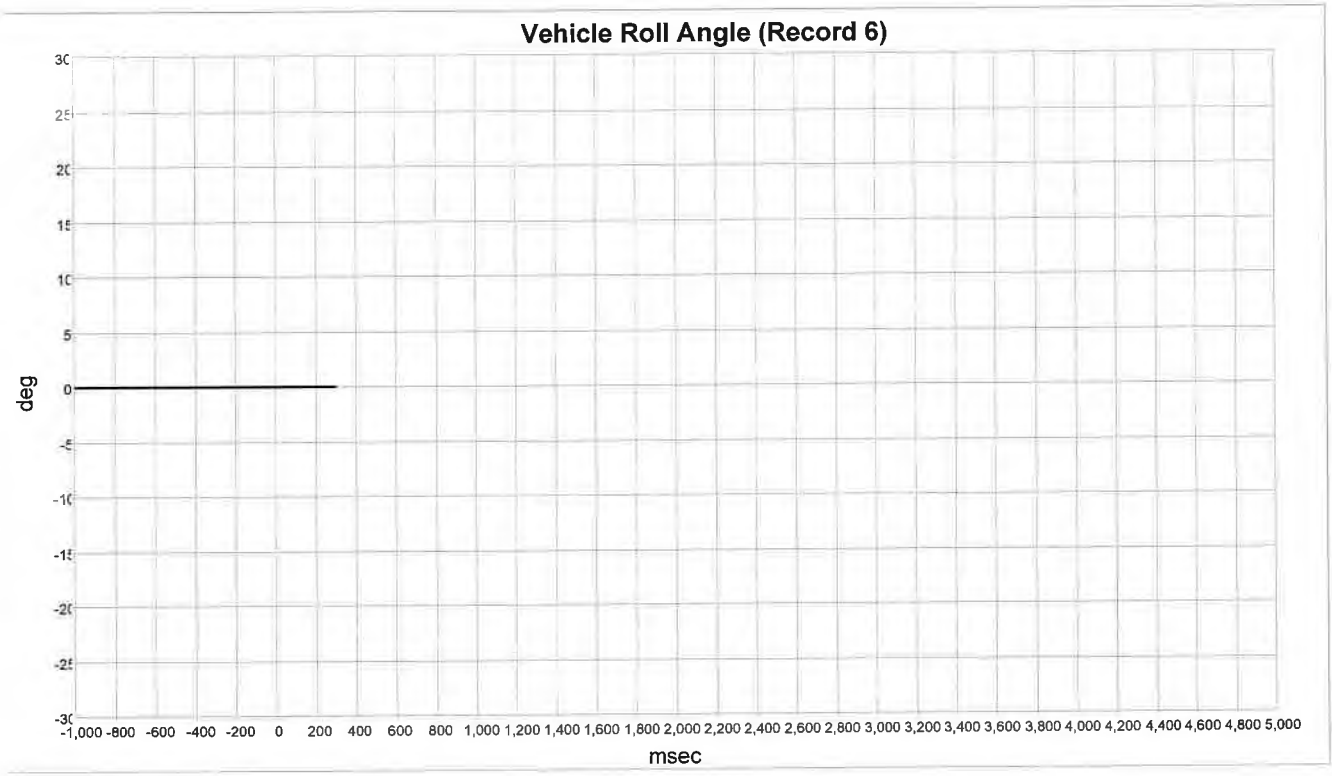
CDR CRASH DATA RETRIEVAL

Normal Acceleration (Record 6)



Time (msec)	Normal Acceleration (g)
0	0.0
10	0.0
20	0.0
30	0.0
40	0.0
50	0.0
60	0.0
70	0.0
80	0.0
90	0.0
100	0.0
110	0.0
120	0.0
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Angle (Record 6)



Time (msec)	Vehicle Roll Angle (deg)
-1000	0
-900	0
-800	0
-700	0
-600	0
-500	0
-400	0
-300	0
-200	0
-100	0
0	0
100	0
200	0
300	0
400	Data Not Available
500	Data Not Available
600	Data Not Available
700	Data Not Available
800	Data Not Available
900	Data Not Available
1000	Data Not Available
1100	Data Not Available
1200	Data Not Available
1300	Data Not Available
1400	Data Not Available
1500	Data Not Available
1600	Data Not Available

[redacted]

CDR CRASH DATA RETRIEVAL

Time (msec)	Vehicle Roll Angle (deg)
1700	Data Not Available
1800	Data Not Available
1900	Data Not Available
2000	Data Not Available
2100	Data Not Available
2200	Data Not Available
2300	Data Not Available
2400	Data Not Available
2500	Data Not Available
2600	Data Not Available
2700	Data Not Available
2800	Data Not Available
2900	Data Not Available
3000	Data Not Available
3100	Data Not Available
3200	Data Not Available
3300	Data Not Available
3400	Data Not Available
3500	Data Not Available
3600	Data Not Available
3700	Data Not Available
3800	Data Not Available
3900	Data Not Available
4000	Data Not Available
4100	Data Not Available
4200	Data Not Available
4300	Data Not Available
4400	Data Not Available
4500	Data Not Available
4600	Data Not Available
4700	Data Not Available
4800	Data Not Available
4900	Data Not Available
5000	Data Not Available

CRASH DATA RETRIEVAL

Hexadecimal Data

FA10 01

FA12 01 00 00 07 F1 00 00 07 F9

FA11 02 00 05

FA13 00 0D 00 01 FF 00 04 FF FF 00 05 FF FF 00 06 FF
FF 00 07 FF FF 00 09 FF FF 00 0C FF FF 00 0D FF
FF 00 0E FF FF 00 0F FF FF 00 11 FF FF 00 16 64
00 00 19 7F FF 7F E2 7F EA 7F E7 7F F0 7F F6 7F
FF 80 06 80 02 7F FF 80 09 80 1A 80 22 80 1F 80
1D 80 1D 80 20 80 21 80 21 80 21 80 21 80 25 80
25 80 25 80 21 80 19 00 17 64 00 00 19 7F A2 7F
92 7F 7B 7F 6B 7F 60 7F 64 7F 6B 7F 7D 7F 94 7F
AE 7F C0 7F CC 7F D6 7F DE 7F E5 7F E8 7F E8 7F
E8 7F E8 7F E8 7F E8 7F E8 7F E8 7F E8 7F E8 7F
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7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
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00 00 4D 00 00 51 00 00 5B 96 93 8C 86 80 73 5B
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07 42 03 F2 00 77 0B 03 F3 57 56 57 5A 5A 5A 41
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0D 03 FE 6F 0C F2 25

FA14 00 0D 00 01 00 00 04 FF FF 00 05 FF FF 00 06 FF
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E8 7F EB 7F EB 7F EB 7F EB 7F E9 7F E8 7F E5 7F
E2 7F E0 7F E0 7F E0 7F E1 7F E6 7F E9 7F E9 7F
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00 25 78 00 28 FF 00 29 FF 00 2D 03 00 2E 02 5C
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00 42 FF FF 00 43 FF FF 00 47 01 00 4B 01 00 4C
00 00 4D 00 00 51 00 00 5B 9A 98 96 93 8C 86 80
73 5B 46 0D 00 5C 00 00 00 00 00 00 00 00 00 00
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00 00 01 01 00 00 61 00 00 00 00 00 00 00 00 00
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EC 00 03 ED 00 03 EE 00 03 EF 00 03 F0 00 03 F1
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0C 03 FE 25 4E F2 4D

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D9 7F FB 7F FA 7F F2 7F DD 7F D5 7F D6 7F D6 7F
D6 7F D7 7F D4 7F D2 00 17 64 00 00 19 7F D1 7F
D2 7F C6 7F E1 80 1B 80 A0 80 7C 80 90 80 48 7F
E4 7F D4 80 08 80 18 80 0C 7F EE 7F CB 7F C4 7F
DC 7F E4 7F E6 7F EF 7F E4 7F DB 7F DD 7F E2 7F
E3 00 19 64 00 00 19 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 00 1B 64 00 0A 32 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
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80 81 81 80 80 80 80 80 80 80 80 80 7F 7F 7F
7F 7F 7F 7F 00 20 64 00 00 19 7F 7F 7F 7E 7D 7B
7A 79 79 79 79 79 79 78 78 78 78 78 78 78 78 78
78 78 78 77 00 21 81 00 22 77 00 23 1E 00 24 76
00 25 76 00 28 FF 00 29 FF 00 2D 02 00 2E 02 5C
00 2F 00 37 00 30 02 5C 00 33 FF FF 00 38 FF FF
00 3D FF FF 00 3E FF FF 00 3F FF FF 00 41 FF FF
00 42 FF FF 00 43 FF FF 00 47 01 00 4B 01 00 4C
00 00 4D 00 00 51 00 00 5B 9C 9A 98 96 93 8C 86
80 73 5B 46 00 5C 00 00 00 00 00 00 00 00 00 00
00 00 5D 45 45 44 43 41 3E 36 2D 27 21 19 00 5E
7F 7F 7F 7F 7F 7F 7F 7F 85 89 E2 00 5F 00 00 00
00 01 01 01 01 01 01 01 00 60 00 00 00 00 00 00
00 00 00 01 01 00 61 00 00 00 00 00 00 00 00 00
00 01 00 65 FF FF 03 CF 00 82 03 DD 54 53 52 03
DE 18 04 11 03 E5 35 51 30 39 35 39 36 35 35 42
48 03 E8 A5 03 E9 06 78 03 EA 06 7D 03 EB 77 03
EC 05 03 ED 07 03 EE 0B 03 EF 1F 03 F0 1E 03 F1
07 42 03 F2 00 77 0B 03 F3 57 56 57 5A 5A 5A 41
55 5A 4A 57 2A 2A 2A 2A 2A 2A 03 FB 04 03 FD 00
0B 03 FE 19 D4 60 A1

FA16 00 0D 00 01 00 00 04 00 00 00 05 00 02 00 06 00
08 00 07 FF FF 00 09 FF FF 00 0C 00 90 00 0D 00
67 00 0E 00 62 00 0F FF FF 00 11 FF FF 00 16 64
06 00 19 7F 80 7F 76 7E 62 7D 87 7C B2 7B FC 7B
65 7C 2E 7D 5F 7E D7 7F A5 7F F5 80 41 80 1A 7F
CB 7F DD 7F EF 80 04 80 0F 80 0C 80 0F 80 01 7F
EE 7F E4 7F EF 7F F6 00 17 64 06 00 19 7F 99 7E
86 7D DB 7B 2E 77 8E 77 90 79 83 7B 06 7D 56 7D
E8 7E B2 7F 2A 7F 54 7F 45 7F 6A 7F 72 7F A4 7F
D3 7F D0 7F C5 7F AA 7F 96 7F AB 7F C7 7F D9 7F
CD 00 19 64 06 00 19 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
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        7F 00 1B 64 06 0A 32 7F 7F 7F 7F 7F 7F 7F 7F 7F
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        FF FF FF FF 00 1F 64 06 00 19 7E 7B 79 72 67 60
        5C 59 58 57 57 57 56 56 55 55 55 55 55 54 54 54
        53 53 53 53 00 20 64 06 00 19 7F 7E 7C 79 76 71
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        00 25 78 00 28 FF 00 29 FF 00 2D 01 00 2E 00 00
        00 2F 01 65 00 30 00 00 00 33 00 06 00 38 00 06
        00 3D FF FF 00 3E 00 11 00 3F 00 06 00 41 FF FF
        00 42 00 11 00 43 00 06 00 47 01 00 4B 00 00 4C
        00 00 4D 00 00 51 00 00 5B 9C 9A 98 96 93 8C 86
        80 73 5B 46 00 5C 00 00 00 00 00 00 00 00 00 00
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        7F 7F 7F 7F 7F 7F 7F 7F 85 89 E2 00 5F 00 00 00
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        00 01 00 65 00 06 03 CF 00 8E 03 DD 54 53 52 03
        DE 18 04 11 03 E5 35 51 30 39 35 39 36 35 35 42
        48 03 E8 A5 03 E9 06 78 03 EA 06 7D 03 EB 77 03
        EC 05 03 ED 07 03 EE 0B 03 EF 1F 03 F0 1E 03 F1
        07 42 03 F2 00 77 0B 03 F3 57 56 57 5A 5A 5A 41
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        0A 03 FE E4 A4 0D 5E

FA17    00 0D 00 01 FD 00 04 FF FF 00 05 FF FF 00 06 FF
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        7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
        7F 00 1B 64 FE 14 28 7F 7F 7F 7F 7F 7F 7F 7F 7F
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        7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
        7F 7F 7F 7F 00 21 7F 00 22 7F 00 23 54 00 24 00
        00 25 54 00 28 FF 00 29 FF 00 2D 01 00 2E 00 00
        00 2F 00 42 00 30 00 00 00 33 FF FF 00 38 FF FF
        00 3D FF FF 00 3E FF FF 00 3F FF FF 00 41 FF FF
        00 42 FF FF 00 43 FF FF 00 47 01 00 4B 00 00 4C
        00 00 4D 01 00 51 00 00 5B 44 42 41 40 3E 3B 36
        30 2D 25 18 00 5C 00 00 00 00 00 00 00 00 00 00
        00 00 5D 12 12 11 11 15 15 13 11 13 10 0D 00 5E
        7F 7E 7E 7F 7F 7F 80 82 87 8B 91 00 5F 01 01 01
        01 01 01 01 01 01 01 01 00 60 00 00 00 00 00 00
        00 00 00 00 00 00 61 00 00 00 00 00 00 00 00 00
        00 00 00 65 FF FF 03 CF 00 8A 03 DD 54 53 52 03
        DE 18 04 11 03 E5 35 51 30 39 35 39 36 35 35 42
        48 03 E8 A5 03 E9 06 47 03 EA 06 7D 03 EB 77 03
        EC 04 03 ED 1C 03 EE 0E 03 EF 06 03 F0 13 03 F1
        06 F8 03 F2 00 73 16 03 F3 57 56 57 5A 5A 5A 41
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        09 03 FE 4C EE BE AE

FA18    00 0D 00 01 FD 00 04 FF FF 00 05 FF FF 00 06 FF
        FF 00 07 FF FF 00 09 FF FF 00 0C FF FF 00 0D FF
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C0 7F C8 7F CE 7F CF 7F CF 7F D3 7F D8 7F DB 7F
DD 7F DD 7F E1 7F E7 7F E8 7F EA 7F EA 7F EA 7F
EC 7F ED 7F ED 7F EE 7F F1 7F F4 7F FA 7F FA 7F
FA 00 19 64 FE 19 00 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
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00 25 2A 00 28 FF 00 29 FF 00 2D 01 00 2E 00 00
00 2F 00 FD 00 30 00 00 00 33 FF FF 00 38 FF FF
00 3D FF FF 00 3E FF FF 00 3F FF FF 00 41 FF FF
00 42 FF FF 00 43 FF FF 00 47 01 00 4B 00 00 4C
00 00 4D 00 00 51 00 00 5B 20 23 26 26 26 26 27
27 28 26 1A 00 5C 2A 24 14 08 0A 0A 0F 14 00 00
00 00 5D 25 29 2B 2C 2C 22 1F 1F 1F 1D 13 00 5E
6B 6E 72 73 76 77 7C 7C 7A 7A 7A 00 5F 00 00 00
00 00 00 00 00 00 01 01 00 60 00 00 00 00 00 00
00 00 00 00 00 00 61 00 00 00 00 00 00 00 00 00
00 00 00 65 FF FF 03 CF 00 8F 03 DD 54 53 52 03
DE 18 04 11 03 E5 35 51 30 39 35 39 36 35 35 42
48 03 E8 A5 03 E9 05 E2 03 EA 06 7D 03 EB 77 03
EC 04 03 ED 0A 03 EE 11 03 EF 2C 03 F0 32 03 F1
06 72 03 F2 00 6A E4 03 F3 57 56 57 5A 5A 5A 41
55 5A 4A 57 2A 2A 2A 2A 2A 2A 03 FB 04 03 FD 00
08 03 FE B7 AA 5F 0E
```

CRASH DATA RETRIEVAL

Disclaimer of Liability

The users of the CDR product and reviewers of the CDR reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Robert Bosch LLC and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Robert Bosch LLC expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the CDR data, CDR software or use thereof.

From: Jason Bayley [jasonmbayley@gmail.com]
on behalf of Jason Bayley <jasonmbayley@gmail.com> [jasonmbayley@gmail.com]
Sent: 7/9/2019 8:33:32 PM
To: Brian Chang-Yun Hsu [changyun.hsu@gmail.com]
Subject: Fwd: CDR Software Subscription Activation Certificate for version 19.0
Attachments: CDR19.0_1_1yr_098731FB.CTF

---------- Forwarded message ---------
From: <BoschLicenses@us.bosch.com>
Date: Tue., Jul. 9, 2019, 4:17 p.m.
Subject: CDR Software Subscription Activation Certificate for version 19.0
To: <jasonmbayley@gmail.com>
Cc: <crash@crashdatagroup.com>

Dear Jason Bayley,

Thank you for your recent purchase of Bosch CDR software subscription(s).

Our records indicate you have purchased the following:
(1) 1 Year CDR Software Subscription(s)

All software subscriptions entitle you to CDR software updates that become available for your indicated subscription period ending on 7/9/2020 3:17:25 PM.

Attached is an Activation Certificate you will need to activate your new CDR software version 19.0 on each computer you are entitled to run the software on. The CDR program explains this in the End User License Agreement which is displayed to you during the activation and you must agree to it before the software can be activated.

For as long as your subscription is current, you will receive a similar email every time a new version of CDR software becomes available. Please save this email and the attached Activation Certificate for future reference and incase you want to transfer the licensed software from one computer to another.

To download, install and activate your CDR software, follow the steps below:

1. Save the Activation Certificate attached to this email to a folder or to your desktop on your computer. You will need this once you have installed the CDR software.

2. Click http://www.boschdiagnostics.com/software/Pages/CDR_software.aspx or, go to www.boschdiagnostics.com and click on the "Crash Data Retrieval" link on the left hand pane on the webpage.

3. Unzip the downloaded file and run the setup.exe program to install the software and follow the installation instructions on screen.

4. Double-click the file you just downloaded and follow the installation instructions on screen.

5. Once the CDR software is installed, start the new CDR software program and click the "Activate" button displayed on the screen after the program is launched.

6. Follow the instructions on the screen and, when prompted, open the Activation Certificate to activate your CDR program.

Hrg. EX. 144

If you need more detailed instructions on installing your CDR software, click on the link below to download an instruction manual.

https://www.boschdiagnostics.com/cdr/sites/cdr/files/CDR_software_Installation_Manual.pdf

If you encounter any problems installing and activating your software, please contact Bosch Diagnostics Technical Support at 1 (855) 267-2483 (toll-free US & Canada) or +1(805) 966-2000 ext. 4, option 1 (international callers).

Sincerely,

The CDR Product Team of Bosch Automotive Service Solutions

G2058 (Collision Sciences)

From: Jason from Collision Sciences [jbayley@collisionsciences.ca]
on behalf of Jason from Collision Sciences <jbayley@collisionsciences.ca> [jbayley@collisionsciences.ca]
Sent: 9/20/2019 7:15:32 PM
To: Mike Conlon [Mike.Conlon@theguarantee.com]; Gregory Fickling [Gregory.Fickling@theguarantee.com]; Marika Walker [Marika.Walker@theguarantee.com]
Subject: Re: Case GC-00254 (11111-8133) - 2017 Audi RS7
Attachments: WUAWRAFC7HN903495_ACM 2017 Audi RS7.PDF; [Case GC-00254] 20190918 Claims 2017 Audi RS7.pdf

Hey GCNA team,

Saw you just downloaded this Audi. We immediately did a replay into the Bosch CDR as the DeltaV is very high (70 km/h) and I can confirm that this value matches the Bosch CDR report, which I have attached. I can explain further how we do this, but essentially, we send the Bosch tool the exact hex data from the EDR.

This severity level is typical of a head-on and a fatality. The car also had 45 enhanced DTCs, clearly very severe frontal damage.

Jason Bayley, P.Eng.
Collision Sciences | CEO & Founder
M: +1 905 599 9899
www.collision-sciences.com | CrashScan™ on Android and iOS | EDR Vehicle Support

On Fri, Sep 20, 2019 at 2:54 PM Collision Sciences <service@collisionsciences.ca> wrote:

CrashScan
Accident Detector

Thank you for your purchase!

Please click on the button below to retrieve the PDF report.

Download Report

Hrg. EX. 151

Vehicle
2017 Audi RS7

Investigator
John Dattomo
northdurhamappraisals@gmail.com
+1-905-391-9788

The Collision Sciences team is always here to help.
Please contact service@collisionsciences.ca with your questions.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	WUAWRAFC7HN903495
User	NONE
Case Number	NONE
EDR Data Imaging Date	
Crash Date	
Filename	WUAWRAFC7HN903495_ACM 2017 AUDI RS7.CDRX
Saved on	Friday, September 20 2019 at 14:59:02
Imaged with CDR version	Crash Data Retrieval Tool 19.1
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 19.1
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	Record 1

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

General Information:
These limitations are intended to assist you in reading the event data that has been imaged from the vehicle's Airbag Control Module (ACM). They are not intended to provide specific information regarding the interpretation of this data. Event data should be examined in conjunction with other available physical evidence from the vehicle and scene.

> **Note:** The ACM's current DTC status will be altered if the ACM is powered-up without the vehicle periphery connected. This situation might occur when the CDR tool is connected directly to the ACM (e.g. for bench top imaging). It will not affect the stored EDR data, but may result in additional DTCs within the ACM.
>
> **Note:** During bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. Also, after a CDR imaging process, wait one minute after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for bench top imaging could cause new events to be recorded in the ACM.

Recorded Crash Events:
This ACM is capable of recording up to 6 events of front, side, rear, or rollover events within its memory. Each record contains 5 seconds of pre-crash data and at least 300ms of post-crash data. Deployment events are locked into memory and cannot be overwritten. Non-deployment events can be overwritten by subsequent deployment or non-deployment events. The oldest non-deployment event will be overwritten first. This ACM stops over-writing of older non-deployment events by more recent non-deployment events after a certain number of events (more than 1000). Under these conditions, the storage of deployment events is still available. The event counter is incremented for each event and stored within the data record.

Deployment events are recorded, when a non-reversible restraint system was commanded to deploy. Recording of non-deployment events requires a minimum delta-V of 8km/h within a 150ms period in either longitudinal or lateral direction. Reversible restraint systems (e.g. active headrests) that have been commanded to deploy also trigger recording of a non-deployment event. Time Zero of an event is determined by the ACM's algorithms based on the acceleration and/or pressure sensors or a deployment command. Post-crash data (e.g. deployment time of restraint systems) is reported relative to Time Zero.

The ACM supports recording of multiple events. In case of a rapid sequence of events (e.g. a combined frontal and side event), the ACM will record the data within a common EDR entry (a so-called parallel event). In this case, the post-crash data is reported relative to Time Zero of the initial event. If the initial event has already ended and another event happens within a time period of 5s from Time Zero of the initial event, the ACM will record a multi-event consisting of two or more separate EDR entries.

If power to the ACM was lost during an event, all or part of the event data record may not have been recorded.

Data:
The reported data elements may vary by vehicle model, model year or vehicle configuration. Part of the pre-crash data has been transmitted to the ACM by various vehicle control modules via the vehicle's communication network.

Time-continuous pre-crash data is recorded at two samples per second for 5 seconds before Time Zero. The main data elements are:

Collision Sciences *CLAIMS REPORT*

EXPOSURE, RISK & DECISION SUPPORT

Claim Number: 11111-8133
Vehicle: 2017 Audi RS7
VIN: WUAWRAFC7HN903495
Report Number: GC-00254
Generated: 2019-09-20 19:11:27

REPORT SUMMARY

This section provides an overview of the predictive analytics used for the estimation of claim severity, exposure, and fraud risk for the most recent crash or event sequence.

Occupant Injury Risk	An extremely severe frontal crash was detected by the Event Data Recorder with a recency of 2 ignition cycles ago. If the detected event is related to the claim in question, the mean acceleration in the impact was 7.84 g. 1st Party - Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks): 30% (Possible). Statistical Likelihood of Moderate Injury (lasting 5 to 6 months): 25% (Possible). Risk of Serious Injury: 95% (Almost Certain) 3rd Party - Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks): 100% (Almost Certain)
Pre-Crash Data	The following reconstruction data analysis relates to the extremely severe frontal crash that was detected by the Event Data Recorder (having a recency of 2 ignition cycles ago): Within the 5.0 seconds of recorded pre-impact data for the most recent crash, the recorded speed range on this vehicle was **68 km/h** to **78 km/h**. The vehicle speed was **68 km/h** at the moment of impact. Driver/Vehicle Maneuver: Going left
Flags / Loss Indicators	Low Risk (0 Alerts)
Diagnostic Scan Results	Event Data Recorder: Scan Completed Successfully 45 Enhanced DTCs Found.
Safety Issues / Ratings	2 Potential Recalls Found. No Safety Ratings Alerts Found. Structural/Frame Damage. Even minor damage, if not repaired properly, can seriously degrade a car's ability to protect you in an accident.
Recommended Action	Expedite Settlement / Treatment. No internal suspicious loss indicators.

CRASH DATA RECORDS

This section lists crash data records stored on the vehicle's event data recorder. The date of crash data collection was 2019-09-18.

Recency / Sequence	Crash Severity	Type / Damage Area	Sudden Speed Change (Delta-V)	Force of Impact (Mean g-Force)	Direction of Force	Ignition Cycles since (Odometer at) Event
Most Recent	Severe, Catastrophic	Front	-71.00 km/h (Decreasing)	7.84 g	359 degrees (12 o'Clock)	2 (42,230 km)

How To Interpret This Information

The crash severity (acceleration / g-force) measured by the airbag module accelerometer reached a maximum value of 71.00 km/h within 160 milliseconds, which is considered "extremely severe" in terms of severity. The vehicle's ignition was turned on 2 times between the incident and crash data download; this number can be used as an indication of event recency. For example, if the vehicle were used an average of 2 times per day, the recorded collision event would have occurred approximately 1 days prior to the the date of retrieval on 2019-09-18.

Crash events are sorted and displayed in order of recency. It is possible for an airbag module to contain multiple records for a single event. In that case, event recency will be further marked by "1st Impact", "2nd Impact"...etc., with "1st Impact" being the initial record in sequence.

PRE-CRASH DATA / Most Recent

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (m)	Vehicle Speed (km/h)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.0	N/A	77	N/A	4.0	Off	N/A	-12 (Right)
-4.5	95.2	77	N/A	7.0	Off	0.0 (Light)	112 (Left)
-4.0	84.5	77	N/A	7.0	Off	0.0 (Light)	60 (Left)
-3.5	73.8	77	N/A	7.0	Off	0.0 (Light)	256 (Left)
-3.0	63.1	77	N/A	10.0	Off	0.0 (Light)	-110 (Right)
-2.5	52.4	77	N/A	0.0	Off	0.0 (Light)	-170 (Right)
-2.0	41.7	77	N/A	88.0	Off	0.0 (Light)	144 (Left)
-1.5	31.0	78	N/A	0.0	Off	N/A	52 (Left)
-1.0	20.3	76	N/A	0.0	Off	-0.1 (Light)	-84 (Right)
-0.5	9.9	74	N/A	0.0	On	-0.1 (Light)	218 (Left)
0.0	0.0	68	N/A	0.0	On	-0.3 (Moderate)	-196 (Right)

How To Interpret This Information

Each pre-crash data set contains recorded vehicle operating status 5.0 seconds prior to impact. Accelerator Pedal, Brake Switch Status, and Steering Angle can be used to reconstruct the driver's maneuver leading up to the impact.

Deceleration (in g) is calculated using speed differences between data points. Note that deceleration depends heavily on road conditions. For example, in winter driving conditions, it may only be possible to reach a peak deceleration of 0.2g.

SEAT BELT & AIRBAG STATUS (Most Recent Crash)

This section lists the restraint system status at the time of the event recording, including airbag deployment status and the seatbelt buckle insertion status for supported seating positions.

Seating Position	Driver	Front Passenger
Occupant Classification	Occupied	Unoccupied
Safety Belt Status	Buckled	Unbuckled
Frontal Airbag	**Deployed**	Not Deployed
Side Seat Airbag	Not Deployed	Not Deployed
Side Curtain Airbag	Not Deployed	Not Deployed
Knee Airbag	Unavailable	Unavailable

FLAGS / LOSS INDICATORS

This section lists flags for further investigation based on known anti-fraud indicators and/or inconsistencies with reported circumstances.

Indicator	Description	Risk Alert
Drive Down	Frontal collision where the driver accelerates up to impact, with no pre-impact brake application.	No
No Avoidance Maneuver	No driver input for either brake or steering maneuver within the 2 seconds prior to impact.	No
Possible Distracted Driver	In a frontal collision, driver did not either brake or steer 2 seconds prior to impact.	No
No Pre-Impact Speed Reduction	Brake is only applied lightly with no meaningful reduction in speed.	No
Steered-To Sideswipe	Driver steers either left or right, causing an impact on the steered-to side.	No
Swoop & Squat	Driver steers to make a lane change and quickly applies brakes.	No
Panic Stop	Rear-end collision where driver brakes just prior to impact.	No

Possible Non-Recent Event	Accident recording may not be recent. Event data recorded 50 or more engine starts prior to data retrieval. Possible issues include: unrelated damage, past posting (no insurance at time of collision)	No
Possible Intentional Damage	Event data recorded on successive engine starts (sequential ignition cycles), or multiple events recorded on the same ignition cycle, where pre-crash data does not overlap.	N/A
Pre-Damaged Vehicle	Evidence of prior accident damage, where data of multiple events was recorded at different engine starts. Possible issues include: Unrelated Damage to Incident, staged Hit & Run, Phantom Accident, or Paper Accident.	N/A
Unbuckled Driver	Driver not wearing seat belt at the time of crash data recording.	No
Unbuckled Passenger	Front passenger not wearing seat belt at the time of crash data recording.	No
Emissions Test Failure	Vehicle failed emissions inspection due to insufficient sensor data or diagnostic trouble codes (DTCs).	No
Low Velocity Impact	An impact in which the mean acceleration is below 3.0 g	No
Odometer Rollback	Flags tampering through a discrepancy with mileage (odometer reading) for successive crash events. Example: for EDRs that store mileage at the crash event, if the most recent crash event has a lower mileage, this is evidence of odometer tampering.	N/A

Reported Circumstances

The flags in this section are generated through cross-referencing provided information (if any).

Indicator	Description	Diagnostic and Predictive Data	Reported Info
Reported Number of Occupants	Compares the reported number of occupants to the available seat sensor data.	1	N/A
Reported Maximum Pre-Impact Speed	Compares the reported travel speed with the pre-crash data and flags a variance of 10 km/h.	78	N/A
Reported Impact Speed	Compares the reported impact speed with the pre-crash data and flags a variance of 10 km/h.	68	N/A
Reported Pre-Impact Maneuver Variance	Compares the reported pre-impact motion with pre-crash data and impact angle for consistency.	Going left	N/A
Reported Appraisal Variance	Compares a provided appraisal estimate with the AI estimate and flags an appraisal variance of +15%.	84075	N/A
Reported Airbag Deployment Variance	Determines whether airbags were manually removed to exaggerate damage by comparing recorded airbag deployment status.	Deployed	N/A
VIN Mismatch	Compares the VIN diagnostically retrieved from the vehicle to the the VIN sticker or provided VIN. Requires claim reference number.	WUAWRAFC7HN903495	N/A

Image Integrity	Utilizes algorithms to identify digitally edited or altered parts in provided photographs.	N/A	N/A
Pre-Accident Vehicle Sale Attempt	VIN identified in online classifieds within the last 6 months.	N/A	N/A

1ST PARTY / INJURY SEVERITY & DURATION

This section predicts occupant injury risk ranging from minor to moderate/serious injury for frontal/side/rear collisions. The injury risk is the statistical incidence, likelihood, and probability of injury as tracked in real-world crash studies using event data recorders. The model uses a regression model of crash severity versus reported injuries as published in scientific studies.

Assumed delta-V: 71.00 km/h

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks)	Statistical Likelihood of Moderate Injury (lasting 5 to 6 weeks)	Risk of Serious Injury
Occupants in Frontal Impact	30% (Possible)	25% (Possible)	95% (Almost Certain)

How To Interpret This Information

On a balance of probabilities, if the likelihood of injury occurrence is below 50%, it is suggested that an injury is more likely not to have occurred. With a high risk of whiplash or other injury, the claim can be expedited. Early treatment is often effective in providing the best probable outcome for patient recovery.

The injury prediction is based on the actual incidence rate or proportion of injury in tracked studies using data from real-world outcomes. The most important factor in predicting the risk of injury or death in a vehicle crash is the crash severity, which is expressed as the velocity change, or Delta-V, experienced by the vehicle during the crash. The Crash Investigation Sampling System (CISS) is the largest database in the world with over 100,000 cases linking injury outcomes with Delta-Vs, which are obtained from field reconstructions. The effects of occupant age, gender, and belt use on injury and fatality risk have been found substantial.

Low Velocity Impact Studies

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with the risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010).

Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Hell et al., 2002) and Sweden (Krafft et al., 2005). In the minor severity studies it was found that occupant's reporting symptoms for greater than one month corresponded to an average delta-V of 12.4 +/- 2.9 mph and a mean acceleration of 5.3 +/-0.6 g. Occupants that sustain soft tissue symptoms for less than one month, on average, corresponded to a delta-V of 6.4 +/-1.3 mph and a mean acceleration of 3.9 +/-0.5 g. The mean acceleration was found to be the best predictor for duration of symptoms.

The following studies describe the impact severity when no injury or only short-term consequences occur: Hell and Langwieder (1998) found that most occupants sustained short-term symptoms in impacts where the change of velocity was 10-15 km/h (6.2-9.3 mph). McConnell et al (1995) performed low-speed rear impacts with seven male volunteers, with velocity changes of up to 10.9 km/h (6.77 mph). None of the volunteers reported whiplash symptoms after a few days. Ono and Kaneoka (1997) and Siegmund et al (1997) found similar results from volunteer tests. In another study with volunteers (Eichberger et al 1996), where the sled impact velocities were 8-11 km/h (4.9-6.8 mph) and the mean deceleration 2.5 g, the volunteers suffered whiplash symptoms for approximately 24 hours.

Typical G-forces (Tolerance)

A hard acceleration or deceleration in a vehicle produces a sustained g-force in the range of 0.6 to 0.8 g. In everyday life, humans experience g-forces stronger than 1 g. The steep ascent of an Airbus A-300 would

produce 1.8 g. A sneeze results in about 3 g of acceleration and typical cough produces a momentary force of 3.5 g. A luge athlete may experience forces of 5.2 g. Roller coasters are usually designed not to exceed 3 g but are known to reach 6.3 g. A slap on the back may produce a force of 4 g. Humans typically black out at 6 g, where fighter pilots where special "g-suits" to withstand forces up to 9 g. A car crash with forces of 10 g can break human bones. A belted occupant in a car crash at 30 g could sustain broken ribs when held by the seat belt. Humans can tolerate localized g-forces in the 100s of g's for a split second, such as a slap to the face. Sustained forces above about 10 g can be deadly or lead to permanent injury.

RELATIVE INJURY RISK / 3RD PARTY EXPOSURE

This section provides a lead indicator for relative 3rd party injury risk based on accident reconstruction principles including conservation of momentum and relative vehicle mass (Delta V2 (Change in velocity) = Delta V1 * M1 / M2). The calculation does not require the vehicles reach a common post-impact velocity. Calculated injury risk applies only to the occupants in another passenger vehicle or light truck as shown and not to any struck pedestrian or cyclist (bicycle or motorcycle).

Assumed 3rd Party Vehicle	3rd Party Vehicle Delta-V / Severity	Statistical Likelihood of Minor Injury Symptoms (lasting 2 days to 2 weeks)	Statistical Likelihood of Moderate Injury (lasting 5 to 6 weeks)	Risk of Serious Injury
Compact Car (1815 kg)	80.78 km/h	100% (Almost Certain)	100% (Almost Certain)	98% (Almost Certain)
Midsize Car (2260 kg)	64.87 km/h	100% (Almost Certain)	100% (Almost Certain)	87% (Very Likely)
Van/SUV/Light Truck (2720 kg)	53.90 km/h	100% (Almost Certain)	100% (Almost Certain)	60% (Likely)
Full Size Truck/SUV (3630 kg)	40.39 km/h	100% (Almost Certain)	100% (Almost Certain)	20% (Possible)

POTENTIAL RECALLS / SAFETY / DIAGNOSTIC SCAN DATA

This section lists any potential outstanding recalls, known safety ratings & issues, retrieved DTCs (Diagnostic Trouble Codes), and respective Freeze Frame impact data, if any.

Potential Safety Recalls

Vehicle safety recall information is received from Transport Canada and includes all known recalls associated with this particular vehicle model. Any listed recalls are potential recalls which can be verified as outstanding or not by providing the VIN to a local dealer's service department.

Recal Date: 2018-02-07
Recall Number: 2018075
Affected System: Label
Description: Certain vehicles may not comply with Canadian Motor Vehicle Safety Regulations. The tire certification label may bear incorrect Gross Vehicle Weight Rating (GVWR) information. The label incorrectly states "520 kg" (1146 lbs) instead of the correct "450 kg" (992 lbs). If an owner were to rely on the incorrect values, it could lead to premature tire failure and vehicle overloading, which could increase the risk of a crash causing injury and/or damage to property.
Correction: Dealers will apply a revised certification label with the correct values.

Recal Date: 2018-07-06
Recall Number: 2018365
Affected System: Airbag
Description: On certain vehicles, a problem with the passenger occupant detection system can cause illumination of the airbag warning light and the airbag system may not properly classify the front passenger. In the event of a crash, the airbag system may not function properly, increasing the risk of injury to a front passenger.
Correction: Dealers will install a passenger occupant detection system repair kit.

IIHS Crashworthiness / Safety Ratings

Insurance Institute for Highway Safety (IIHS) in the US publishes vehicle safety ratings based on actual crash tests. In each category, the possible ratings are: Good, Acceptable, Marginal, and Poor. Further vehicle research on safety ratings and features, reviews, tips and more can be found here: www.iihs.org/iihs/ratings.

The overall IIHS Crashworthiness / Safety Rating for this vehicle is "Good".

Diagnostic Trouble Codes (DTCs)

Diagnostic Trouble Codes (DTCs) are set by a control module when it detects faults in its system through self-diagnostics. The following section lists DTCs retrieved from various control modules of the vehicle.

Engine Control Module (ECM)	No Issues Found
Transmission Control Module (TCM)	No Issues Found

Enhanced DTCs (Beta)	**45 Codes Found: U012097, B003002, B003005, B003008, P001A01, P00110D, P0019FE, P003003, P004D02, U3FFF00, U3FFF01, U3FFF10, U3FFF00, U3FFF01, P000002, B000200, B001200, P000120, P000124, P000132, P000135, P000141, P000602, P00010B, P000182, P000184, P00022A, U112318, U10BA00, P00001C, P00002E, P000031, P0000A5, P0000AD, P000050, U000300, U00030D, U00040A, U001B01, U000300, U00030D, U00040A, B12BE19, B12BE1A, B12C121**

Freeze Frame Data

Freeze Frame Data refers to a snapshot taken by a control module when it detects a fault in its system. The snapshot consists of measured values from various sensors and can be useful in determining the root cause of the fault. Note that not all vehicles support the items listed below and thus some values may be inaccurate.

No freeze frame data for DTCs (Diagnostic Trouble Codes) were retrieved from the ECM (Engine Control Module) or TCM (Transmission Control Module).

EXPOSURE / AUTO PHYSICAL DAMAGES

This section provides predictive loss and repair estimate/cost information. AI inputs: Trusted Repair Estimates, Max Delta-V, Impact Angle, Vehicle Model/Specs (weight, stiffness), Airbag Deployment status, DTCs, Damage Area/Level/Photographs (if any).

Repair Estimate (AI Prediction)	Salvage Value (80% of Market Value)	Prediction: Total Loss / Repairable	Value Certainty
CAD $111,562.62	N/A	Likely Total Loss	42%

How To Interpret This Information

The vehicle is predicted to be a Total Loss. The algorithmic repair estimate exceeds the estimated salvage (as damaged) value of the vehicle. The algorithmic repair estimate for this prediction considered "total repair estimates" from similar vehicles, with similar recorded impact configuration and severity, also requiring airbag replacement. Photographs of the damaged vehicle were not used to generate the prediction.

The repair estimate does not replace a physical damage appraisal. Collision Sciences is working with strategic partners to develop an advanced repair cost prediction algorithm using a combination of photo-based estimating, diagnostically detected impact configuration and severity, and diagnostic issues requiring repair. The repair estimate may currently be used to predict a total loss or repairable condition, identify potentially exaggerated repair estimates and provides a contextual frame of reference for claim severity.

VEHICLE SPECIFICATIONS

This section lists basic vehicle details encoded by the VIN.

VIN	WUAWRAFC7HN903495	**Year**	2017
Make	Audi	**Model**	RS 7

Trim	Performance Prestige	**Engine**	4.0-L V-8 DOHC 32V
Made In	Germany	**Style**	Quattro
Steering Type	Rack & Pinion	**Anti-Lock Brakes**	4-Wheel ABS
Fuel Type	Premium Unleaded (Required)	**Fuel Capacity**	75 L
Overall Length	5011 mm	**Overall Width**	1910 mm
Overall Height	1417 mm	**Standard Seating**	4
Curb Weight	2065 kg	**Gross Weight**	N/A
Highway Mileage	11 km/L	**City Mileage**	6 km/L

Event Data Disclaimer

It is important to note is that if a vehicle was spinning or rolling surrounding the collision, then the report's speed measurements would not accurately reflect the actual speed of the vehicle during/after it lost control; the speed measurement is typically based on the wheel speed sensor. Signs of this type of anomaly would be rapid changes in speed between the brief timing intervals. The reported speed may be an average of the four wheels; thus could also be skewed by spinning wheels. In combination with scene evidence, an expert could assess vehicle speed by analyzing the data via accident reconstruction and engineering analysis.

Users of the Collision Sciences service and reviewers of the reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Collision Sciences Inc. and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Collision Sciences Inc. expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the online services, evidence logistics, EDR data, EDR software or use thereof.

Injury Risk / Biomechanical Assessment Disclaimer

The estimated injury risks are calculated based on the recorded crash pulse, relative energy changes, known vehicle characteristics in standardized and real-world crashes, published databases, and recognized studies. The provided information can be used as a guide in settlement decisions but cannot be used to definitively prove the existence or non-presence of an injury. In cases with a very low risk of whiplash or other injury, claims can be identified for further investigation. Conversely, for cases with a high risk of whiplash or other injury, the claim can be expedited, since early treatment is often effective in reducing the long term prognosis.

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010). Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Hell et al., 2002) and Sweden (Krafft et al., 2005). Injury risk studies consider the following risk factors: Crash configuration (front, side, rear, rollover), Delta-V = Change in velocity, Vehicle mass (size, weight), Vehicle stiffness, Vehicle geometry and engagement, Restraint system and its adjustment, Occupant seated position, Occupant profile (age, gender, previous injury), Number of WAD symptoms, and Psychological Distress. Structural damage and known whiplash thresholds overlap, indicating structural damage and repair cost are a poor predictor of minor injury threshold. Damage can also vary widely by vehicle model and impact configuration.

From: Brian from Collision Sciences [bhsu@collisionsciences.ca]
on behalf of Brian from Collision Sciences <bhsu@collisionsciences.ca> [bhsu@collisionsciences.ca]
Sent: 9/25/2019 10:04:42 PM
To: Jason from Collision Sciences [jbayley@collisionsciences.ca]
Subject: Re: 01-001-721321
Attachments: 4T1BF1FK0CU115759_ACM 2012 Toyota Camry.PDF

Here you go. Note that lateral delta-v values are not that accurate in our report.

Best Regards,

Brian Hsu, P.Eng.
CTO, CollisionSciences.ca
M: 1.647.898.4560
2680 Matheson Blvd E. Suite 102
Mississauga, ON Canada L4W 0A5

On Wed, Sep 25, 2019 at 5:28 PM Jason from Collision Sciences <jbayley@collisionsciences.ca> wrote:
Hey, can you please do a replay...

Jason Bayley, P.Eng.
Collision Sciences | CEO & Founder
M: +1 905 599 9899
jbayley@collisionsciences.ca | www.collisionsciences.ca

---------- Forwarded message ---------
From: **Whiteside, Brandon C** <BWHITESI@amfam.com>
Date: Wed., Sep. 25, 2019, 4:23 p.m.
Subject: 01-001-721321
To: Jason from Collision Sciences <jbayley@collisionsciences.ca>

Hi Jason,

How do I interpret this report for the most recent accident that occurred in a parking lot causing minimal damage on 07/08/19? There was minor damage to our insured's front passenger bumper.

It looks like the report detected several crashes.

How fast was the vehicle going at the time of impact for my accident?

Hrg. EX. 152

Was there any occupants?

Brandon Whiteside, MSCJ, FCLS, AIC

SIU Investigator II

Office: 317-815-4400 x42438

Fax: 844-340-4475

bwhitesi@amfam.com

6000 American Pkwy, Madison, WI 53783

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN/Frame Number	4T1BF1FK0CU115759
User	NONE
Case Number	NONE
EDR Data Imaging Date	
Crash Date	
Imaged with CDR version	Crash Data Retrieval Tool 19.1
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 19.1
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	Front/Rear (2), Side (2)

Comments

No comments entered.

Data Limitations

CDR Record Information:

- Due to limitations of the data recorded by the airbag ECU, such as the resolution, data range, sampling interval, time period of the recording, and the items recorded, the information provided by this data may not be sufficient to capture the entire crash.
- Pre-Crash data is recorded in discrete intervals. Due to different refresh rates within the vehicle's electronics, the data recorded may not be synchronous to each other
- Airbag ECU data should be used in conjunction with other physical evidence obtained from the vehicle and the surrounding circumstances.
- If the airbags did not deploy or the pretensioners did not operate during an event that meets a specified recording threshold, it is called a Non-Deployment Event. Data from a Non-Deployment Event can be overwritten by a succeeding event that meets the specified recording threshold. If the airbag(s) deploy or the pretensioners are operated, it is called a Deployment Event. Deployment Event data cannot be overwritten or deleted by the airbag ECU following that event.
- If power supply to the airbag ECU is lost during an event, all or part of the data may not be recorded.
- "Diagnostic Trouble Codes" are information about faults when a recording trigger is established. Various diagnostic trouble codes could be set and recorded due to component or system damage during an accident
- The airbag ECU records only diagnostic information related to the airbag system. It does not record diagnostic information related to other vehicle systems
- The TaSCAN, Global Tech Stream, or Intelligent Tester II devices (or any other Toyota genuine diagnostic tool) can be used to obtain detailed information on the diagnostic trouble codes from the airbag system, as well as diagnostic information from other systems. However, in some cases, the diagnostic trouble codes of the airbag system recorded by the airbag ECU when the event occurred may not match the diagnostic trouble codes read out when the diagnostic tool is used.

General Information:

- The data recording specifications of Toyota's airbag ECUs are divided into the following categories. The specifications for 12EDR or later are designed to be compatible with NHTSA's 49CFR Part 563 rule.
  - 00EDR / 02EDR / 04EDR / 06EDR / 10EDR / 12EDR / 13EDR / 15EDR / 17EDR / 19EDR
- The airbag ECU records data for all or some of the following accident types: frontal crash, rear crash , side crash, and rollover events. Depending on the installed airbag ECU, data for side crash and/or rollover events may not be recorded.
- This airbag ECU records post-crash data, and depending on the airbag ECU, may record pre-crash data.
  - If a single event occurs independently, the data for that event is recorded on a one-to-one basis.
  - If multiple events occur successively (within a period of approximately 500ms), the establishment of the recording trigger for the first event is defined as the "pre-crash recording trigger". Pre-crash data for the first event and post-crash data for each successive event is then recorded.
  - In some situations, pre-crash data may be re-recorded if an event continues for more than 0.5 seconds.
- The airbag ECU has two recording pages (memory maps) to store pre-crash data. Additionally, to store post-crash data, the airbag ECU has two recording pages for each accident type: two pages for frontal and rear crash, two pages for a side crash, and two pages for rollover event.
- The data recorded by the airbag ECU includes correlating information between each previously occurring event (i.e., information that clarifies the collision event sequence This correlation information consists of the following items
  - Time from Previous Pre-Crash TRG
  - Linked Pre-Crash Page
  - Time from Pre-Crash TRG
  - TRG Count
  - Previous Crash Type

From: service=collisionsciences.ca@mail.collisionsciences.ca [service=collisionsciences.ca@mail.collisionsciences.ca]
on behalf of Collision Sciences <service@collisionsciences.ca> [service@collisionsciences.ca]
Sent: 8/4/2020 5:28:14 PM
To: Brian Hsu [bhsu@collisionsciences.ca]
Subject: ALERT - Honda Cable 825 Module Scanned

CrashScan
Accident Detector

Honda Cable 825 Module Scanned

This vehicle uses Honda cable 825. Check data accuracy with CDR replay.
Check if any new information is available.

View Report

Vehicle
2018 Honda Accord

VIN
1HGCV1F39JA211930

The Collision Sciences team is always here to help.
Please contact service@collisionsciences.ca with your questions.

Collision Sciences

From:	Jason from Collision Sciences [jbayley@collisionsciences.ca]
on behalf of	Jason from Collision Sciences <jbayley@collisionsciences.ca> [jbayley@collisionsciences.ca]
Sent:	4/12/2018 5:43:15 PM
To:	LBharat@thecommonwell.ca; IConvery@thecommonwell.ca; aball@thecommonwell.ca; Janine Ponee, CIP [JPonee@thecommonwell.ca]; jgeelen@thecommonwell.ca; PLeerentveld@thecommonwell.ca
CC:	Chad Zinn [chad.zinn@collisionsciences.ca]
Subject:	RE: New Crash Data Tech (Forensic APP/AI, Evidence Logistics)
Attachments:	5GAKVCKD3HJ269371_ACM_2017BuickEnclave - CrashScan App Live Demo (Commonwell).PDF; CollisionSciences.ca Slide Deck (for Commonwell).pdf

Hi Commonwell Claims Team!

Thanks for hosting us and very nice meeting everyone. We are glad the presentation was well received and we look forward to providing great long-term value and at no initial cost to Commonwell!

I have attached the presentation Slide Deck and the Crash Data Report for the Buick from the live app demo. The Bosch report is not too interesting as there was no crash data; however, we look forward to providing you many useful reports during a pilot.

Below is a services overview and some information on how to take a closer look at the app/platform. We look forward to meeting again soon.

Thanks!

Jason & Chad

Deliverables Summary:

- We offer free, scalable solutions for crash data preservation (via app/adapter or airbag module evidence tracking through CollisionSciences.ca)
- We offer a free online repository for digital crash data reports (accessible via CollisionSciences.ca for in-house use, and likely via the ISB Canada Order Centre in the future)
- We offer two tiers of reports: the pre-claim AI "EDR ClaimAlert" Report (fraud alerts, predictive loss severity: repair cost and injuries), and the engineer's Bosch Crash Data Retrieval Report
- Preserve all the digital data/modules you want for free (via in-house personnel or utilizing collision centres); the fee is $275 for us to process the data into the Bosch PDF report (the fee is the same for digital processing or lab processing of an airbag module)
- Ideally all CRCs & body shops use a shareable diagnostic adapter provided by Collision Sciences for routine crash data preservation

Notes for in-house use:

Insurance Cloud Account Registration (Required for CrashScan App Login)
The cloud platform provides an automated order tracking and billing solution, but also provides an easy way for you to have any airbag module shipped to our lab, where a quick order produces a chain of custody form and shipping label. These attachments can be emailed to you or straight to a collision centre to handle. Note the fee is $275, inclusive of shipping. We created a custom registration for you to evaluate the platform. If you register on the site, you can login to the CrashScan app also.
Note that you only need one cloud account for your team for billing, but account users can be created as well.
Register here:

https://collisionsciences.ca/reports/commonwell/registration.php

Android App:
App name on Google Play: CrashScan | Accident Detector (OBDLink Bluetooth)
https://play.google.com/store/apps/details?id=ca.collisionsciences.app&hl=en

An engineer in your pocket
For your reference, the OBD device can be purchased on Amazon for about $120 (OBDLink MX). We can bring and leave a kit for your internal demo use at our next demo/meeting.

Best Regards,

Jason Bayley, P.Eng.
CTO, CollisionSciences.ca
M: 1.905.599.9899
2680 Matheson Blvd E. Suite 102
Mississauga, ON Canada L4W 0A5
View My Calendar

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	5GAKVCKD3HJ269371
User	
Case Number	
EDR Data Imaging Date	04/12/2018
Crash Date	
Filename	5GAKVCKD3HJ269371_ACM_2017BUICKENCLAVE.CDRX
Saved on	Thursday, April 12 2018 at 11:22:19
Imaged with CDR version	Crash Data Retrieval Tool 17.7.1
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 17.7.1
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	NONE

Comments

No comments entered

Data Limitations

Recorded Crash Events:

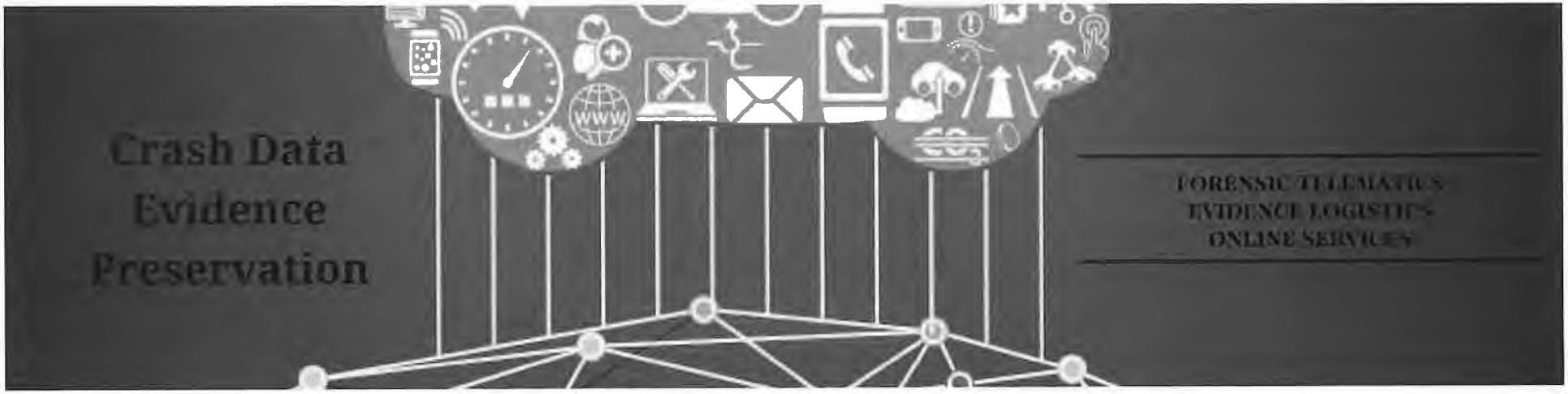
There are two types of recorded crash events for Front, Side, and Rear (FSR) Events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH [8 km/h]. A Non-Deployment Event contains Pre-Crash and Crash data. The oldest Non-Deployment event can be overwritten by a Deployment Event, if all three records are full and the Non-Deployment Event is not locked. A Non-Deployment Event can be overwritten by a more recent Non-Deployment Event if all three records are full and the Non-Deployment is older than approximately 250 ignition cycles. Also, a Non-Deployment event can be recorded if one of the following occurs without the Deployment of any of the frontal air bags, side air bags, or roll bars:

-Pretensioner(s) only Deployment
-Head Rest Deployment
-Battery Cut-Off Deployment

The second type of SDM recorded crash event for FSR Events is the Deployment Event. It also contains Pre-Crash and Crash data. Deployment Events cannot be overwritten or cleared by the SDM.
Rollover Events contains Pre-Crash and Crash data. Rollover event follow the same rules as FSR Deployment events.
The SDM can store up to three Events.

Data:

For FSR Events, SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment and Non-Deployment Events, the SDM will record up to 300 milliseconds of data after time zero. The SDM will also record up to 300 milliseconds of Vehicle Acceleration data after time zero.
For Rollover Events, the SDM may record Lateral Acceleration, Vertical Acceleration, and Roll Rate data, if the SDM is rollover capable. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Deployment Events, the SDM will record up to 700 milliseconds of data before the Deployment criteria is met and 290 milliseconds after the Deployment criteria is met.
-Deployment loops may be displayed as being deployed in a Non-Deployment event record, if a Deployment event is qualified during the Non-Deployment event. That is, if two or more events are occurring at the same time and one is a Non-Deployment event and one of the others is a Deployment event, and the Deployment event is qualified while the Non-Deployment is still active, the deployed loops may be recorded in the Non-Deployment event record.
-Time between events is recorded in 10 msec intervals and is displayed in seconds for a maximum time of 655.33 seconds. The counter measures the time from the start of one event to the start of the next event if both events occur within the same ignition cycle.
-The Maximum SDM Recorded Vehicle Velocity Change may occur between the recorded 10 millisecond sample points of the SDM Recorded Vehicle Velocity Change.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.
-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:



Black Box Data: accessible & intelligent

Real-time cloud-enabled AI Alerts, Bluetooth Car Adapter for Data Capture, "engineer" Crash Data Report PDFs, Lab Service

Presented by:

Jason Bayley, P.Eng.
Founder & CEO, Collision Sciences Inc.

Chad Zinn, Partner
Chief Sales Officer, Collision Sciences Inc.

THE COMMONWELL MUTUAL INSURANCE GROUP

Collision Sciences

All about Crash Data

COLLISION SCIENCES INC

"Black Box" Crash Data provides scientific proof of what happened:

Vehicle speed, seat belt use, driver's brake pedal and accelerator pedal use, collision severity.

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What's in a Crash Data Report pdf?

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger SIR Suppression Switch Circuit Status (if equipped)	Air Bag Not Suppressed
Ignition Cycles At Deployment	25184
Ignition Cycles At Investigation	25223
Maximum SDM Recorded Velocity Change (MPH)	-17 08
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	75
Time Between this Event and the Previous Event (sec)	N/A
Time From Algorithm Enable to Deployment Command Criteria Met (msec)	15

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	50	1472	38
-4	48	1472	43
-3	48	1472	43
-2	48	1472	43
-1	48	1472	38

Seconds Before AE	Brake Switch Circuit State
-8	OFF
-7	OFF
-6	OFF
-5	OFF
-4	OFF
-3	OFF
-2	OFF
-1	OFF

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What if crash data science could be preserved or applied to every accident claim?

Improve customer experience and retention after a claim

Reduce Claim Cycle for evidence collection: average of 3 weeks for crash data evidence? Future: Artificially Intelligent Accident Reconstruction?

Reduce Claim Cycle using AI: days or weeks for appraisal/repair estimate?

Predict Exposure for reserves in real-time

Proactive preservation: lawsuit can be filed up to 2 years later, vehicle is gone, ensure scientific proof exists for every accident

Reduce Fraud: costs estimated up to 1.5 billion dollars annually (Ontario)

Reduce insurance rates for customers through cost savings

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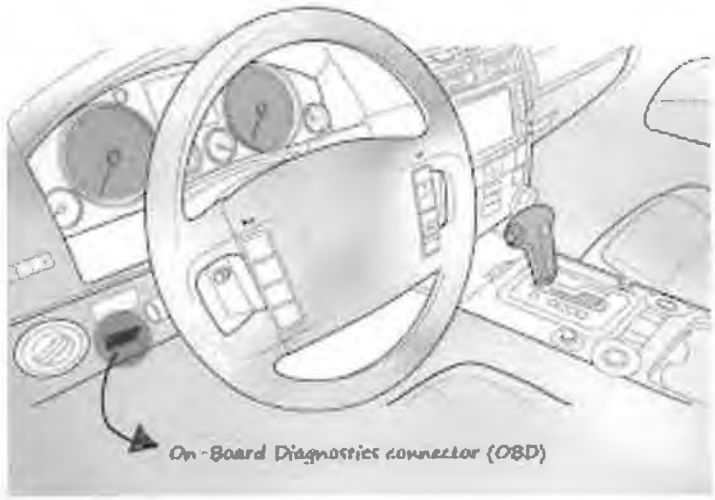
How is crash data accessed?

Need Diagnostic Scan tool and access to either:

a) Airbag Module

b) Diagnostic Port



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Current Process: Engineer attends Vehicle

Average cycle time: 3 weeks? Expensive?

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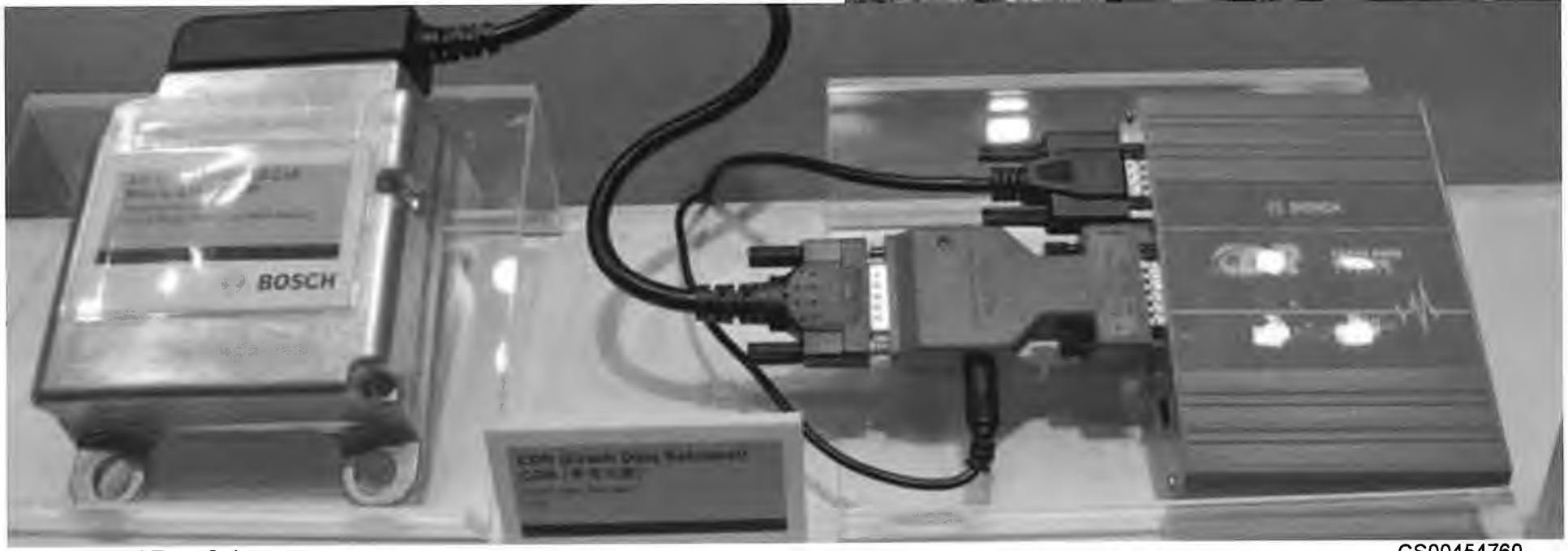

Attorneys' Eyes Only

CS00454760

How can crash data be captured for every Accident?

Our hardware/software tech solutions:

a) Online Platform - ship modules to a central Crash Data Lab (severe accidents)

b) Inexpensive equipment, Cloud Scantool & Data Analyzer, access to "engineer" Crash Data Reports

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ISB Canada

Logged in: Ron Hartman (ISB Canada)

SEARCH

PLACE ORDER

New Order

PAST ORDERS

View Orders

Statements

USERS

Primary Account

Add/Manage Users

SETTINGS

General

Users

Contacts

Billing

FREE TOOLS

Android App

iOS App

3rd Party Evidence Letter & Attorneys' Eyes Only

HOW TO PLACE AN ORDER for a Crash Data Report:
Step 1. Confirm Vehicle is Supported (must be on list below)
Step 2. Determine Service Type (Lab/Field)
Step 3. Provide Claim/Vehicle/Contact Information

Step 1. Confirm Vehicle is Supported (must be on list below)

Vehicle Year *

Select Year

Vehicle Make *

Vehicle Model *

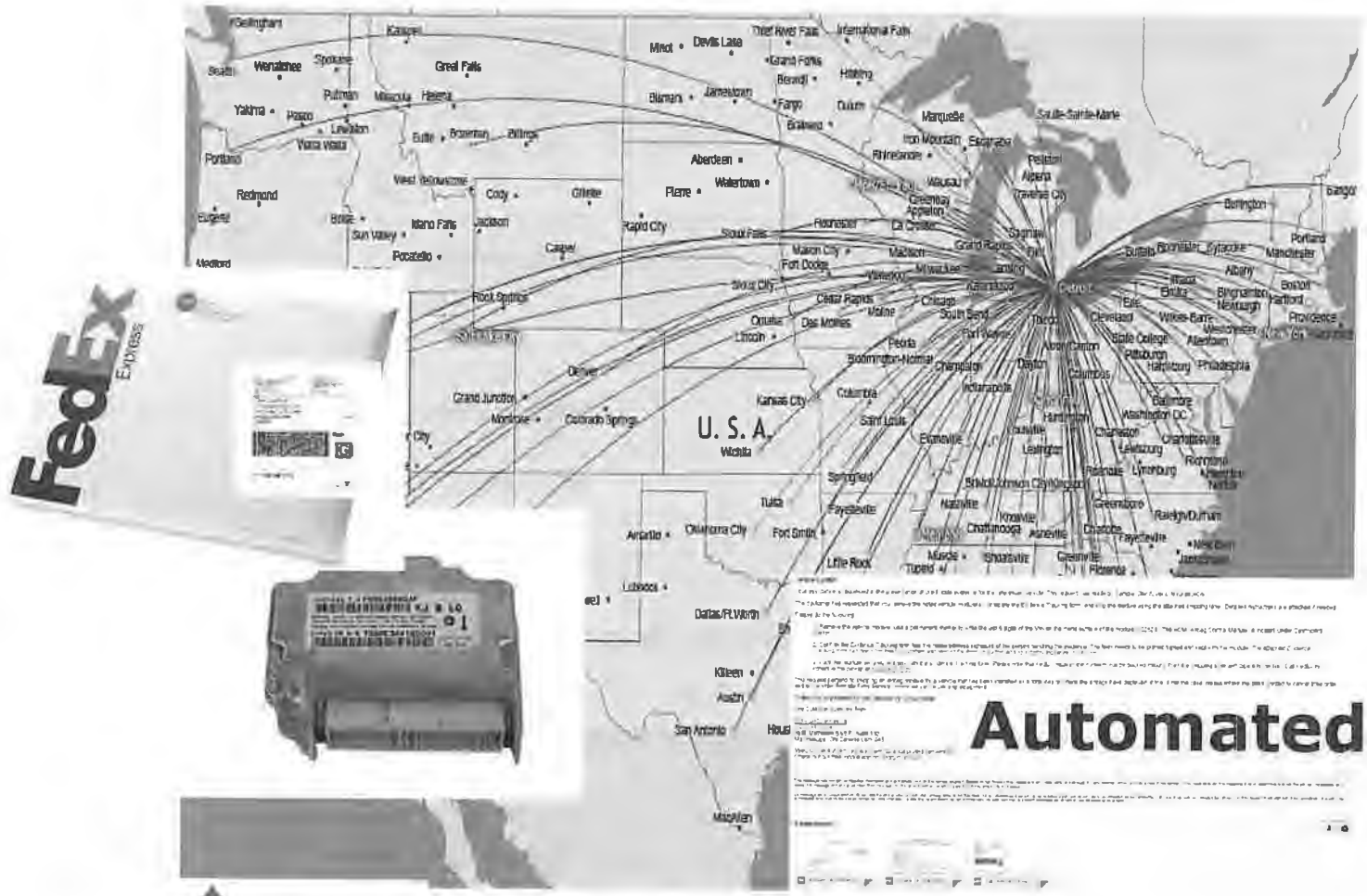
Step 2. Determine Service Type (Lab/Field/Storage)

Does the vehicle meet either of the following conditions?
i) the vehicle is a total loss
ii) one or more airbags deployed

Yes No

CS00454762

Ship modules to our central lab



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Evidence Logistics (Automated Emails)

If you are unable to to print the attached shipping label and/or do not have an envelope or small box to ship us the module, then you can request that we ship you a return envelope. Please forward this email to admin@collisionsciences.ca with the subject: Return Envelope Required.

This request pertains to a vehicle that has been identified as a total loss, or for vehicle where the airbags have deployed. If the vehicle is not a total loss, please inform the client contact.

Thank you in advance for your assistance in this matter.

Sincerely,

The Crash Data Central Team

3 Attachments

PDF Evidence Preserv...

PDF Chain of Custody...

PDF Lab Service Ship...

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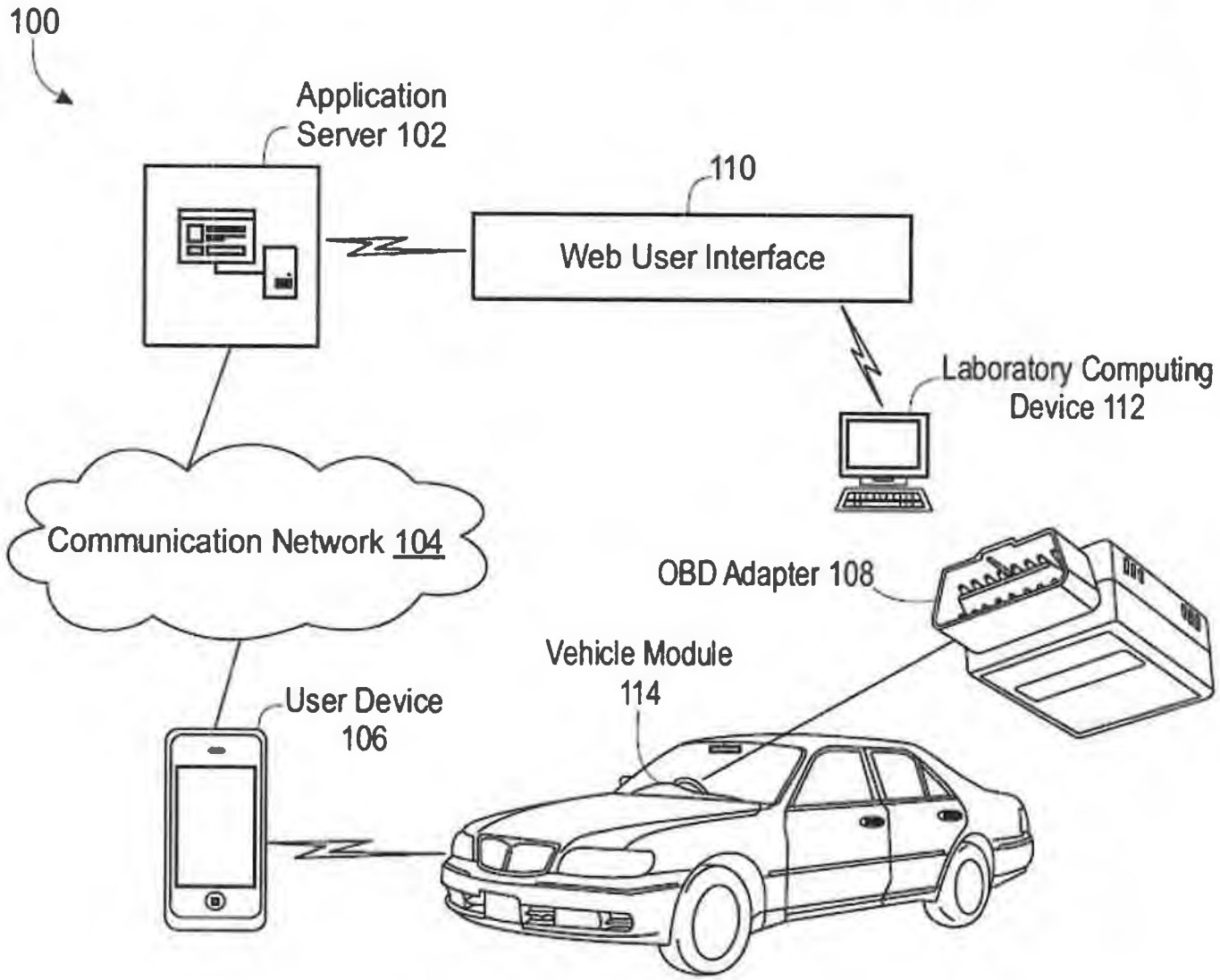
Patent Drawing



Car to Cloud (App/API)

Mobile App/Car Adapter: distribute adapter for routine use by Collision Centres, Field Investigators/Adjusters

AI: Real-time Claim Alerts by email or to Guidewire

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ISB Canada

Logged in: Ron Hartman (ISB Canada)

SEARCH

PLACE ORDER

New Order

PAST ORDERS

View Orders

Statements

USERS

Primary Account

Add/Manage Users

SETTINGS

General

Users

Contacts

Billing

FREE TOOLS

Android App

iOS App

Recent Orders

*Paid and Processed Crash Data Reports

Order#	Account User	Date	Year / Make / Model	Claim#	Total	Crash Data Report Files
2668	Sample InsuranceUser	June 06, 2017	2014 / Dodge / Avenger	BI-876	310.75 view	File1: CDR Source File File2: Crash Data Report PDF Evidence Tracking Form
2662	Sample InsuranceUser	June 06, 2017	2013 / Lexus / RX	BI-0098	310.75 view	File1: CDR Source File File2: Crash Data Report PDF Evidence Tracking Form

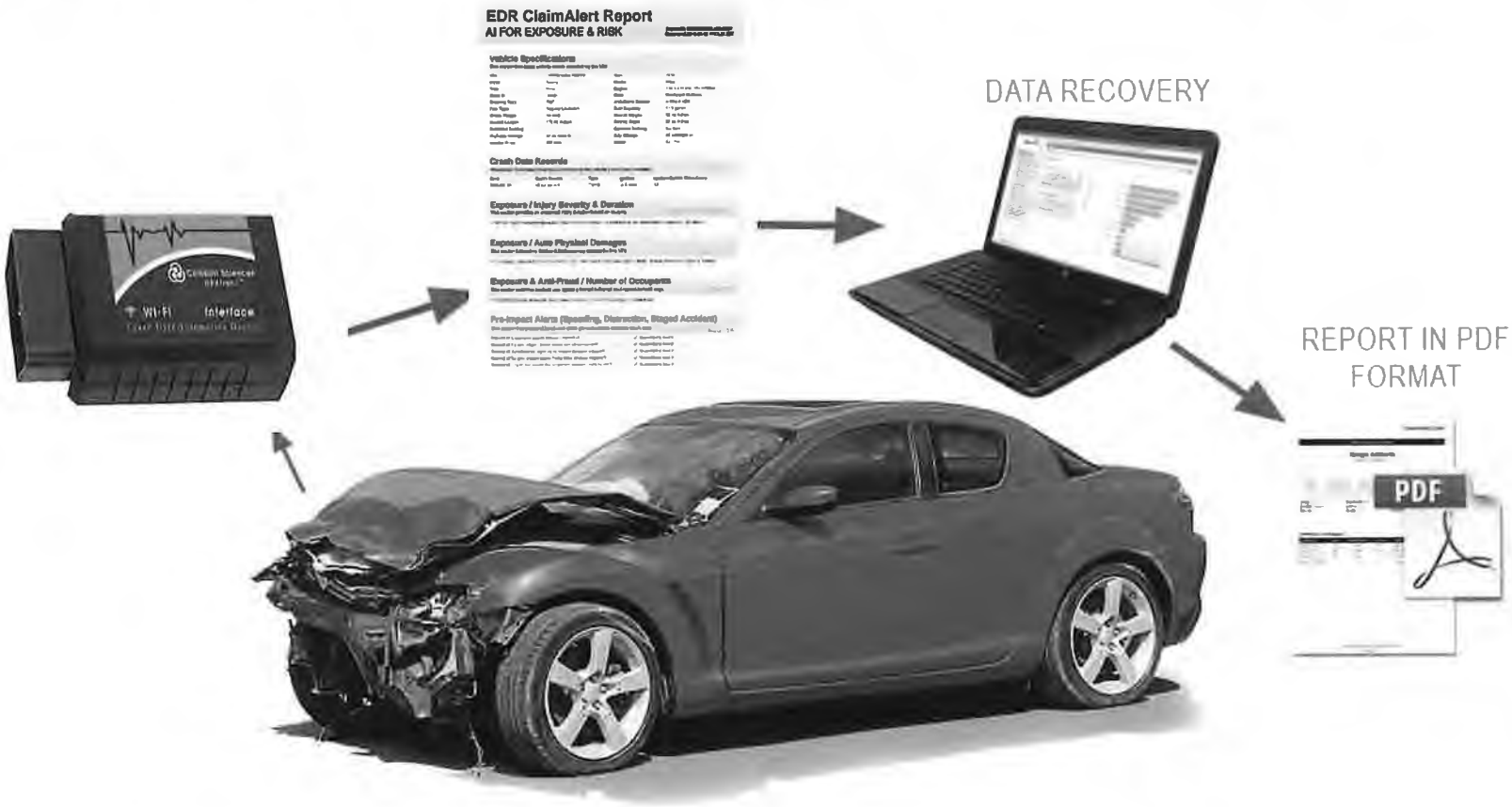
Routine Orders (Evidence Manager)

*Unpaid and Unprocessed Crash Data evidence (stored airbag modules and/or digital crash data files)

Order#	Account User	Date	Year / Make / Model	Total	Order Type	Crash Data Report Files
2923	Sample InsuranceUser	June 30, 2017	2014 / Acura / MDX	0.00 view	Digital Crash Data Only	File1: CDR Source File File2: Crash Data Report PDF Download
2665	Sample InsuranceUser	June 06, 2017	2004 / GMC / Safari	0.00 view	Stored Airbag Module	Evidence Tracking Form Process/Ship Module

Cloud-based Scan Tool: PDFs & AI Context

Cycle Time: Real-time or 3-minutes



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EDR ClaimAlert Report

AI FOR EXPOSURE & RISK

Report ID: CRASHSCAN #9243657
Generated: 2018-03-18 11:03:22 EST

Vehicle Specifications

This section lists basic vehicle details encoded by the VIN.

VIN	JTDKB20U567066092	Year	2006
Make	Toyota	Model	Prius
Trim	Base	Engine	1.5L L4 DOHC 16V HYBRID
Made In	Japan	Style	Hatchback (4-Door)
Steering Type	R&P	Anti-Brake System	4-Wheel ABS
Fuel Type	Regular Unleaded	Fuel Capacity	11.9 gallon
Gross Weight	No data	Overall Height	58.10 inches
Overall Length	175.00 inches	Overall Width	67.90 inches
Standard Seating	5	Optional Seating	No data
Highway Mileage	51 miles/gallon	City Mileage	60 miles/gallon
Invoice Price	$20,006	MSRP	$21,725

Crash Data Records

This section lists crash data records stored on the vehicle's event data recorder. Source: EDR

Date	Crash Record	Type	Ignition	Ignition Cycles Since Event
2006-01-30	Minor Severity	Frontal	-2.5 km/h	12

Exposure / Injury Severity & Duration

This section provides an expected injury duration based on severity. Source: Collision Sciences AI

✓ Minor impact severity detected. The recorded Delta-V is well below the threshold for whiplash at -8km/h.

Exposure / Auto Physical Damages

This section lists active theft and theft recovery records for this VIN. Source: VA, NICB

✓ Damages expected to be cosmetic only. Structural crush damage unlikely. Repair Estimate: $800 to $1000.

Exposure & Anti-Fraud / Number of Occupants

This section confirms seatbelt use, typically limited to frontal seating positions (if any). Source: EDR

✓ Seatbelt Circuit status for driver was "buckled". Front Passenger: "unbuckled".

Pre-impact Alerts (Speeding, Distraction, Staged Accident)

This section lists potential fraudulent alerts generated from scientific crash data. Source: EDR

Record of Excessive Speed (above 120km/h)?	✓ No problems found!
Record of No pre-impact brake pedal use (distraction)?	✓ No problems found!
Record of Acceleration right up to impact (staged impact)?	✓ No problems found!
Record of No pre-impact brake Pedal Data (staged impact)?	✓ No problems found!
Record of Crash not stored but expected (staged, vehicle off)?	✓ No problems found!

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Real-time Fraud Alerts for Guidewire (Examples)

- Brake Pedal data: if in the 8-seconds of pre-impact data, there is no braking: Potential staged accident or distracted driver (note that no braking can be an indication of distraction)
- Speed/Accelerator Pedal data: if 5-seconds of pre-impact data does not match the CRC statement or diagram, then staged accident alert
- If accelerator pedal data was being depressed up until impact, that may indicate a staged impact
- If the seatbelt status was "unbuckled" that could indicate a passenger was not in the seating position. Seatbelt status usually available for front seating positions.
- Acceleration (Maximum Velocity Change): if value is below 8 km/h (very low speed impact, no injury expected). There is also a range of delta-v for injury duration (exposure), i.e. 3-6 months, or 6-months
- If no crash data is recorded, vehicle may have been "off", could indicate a potential staged collision
- If no passenger is passenger seat, there is maximum of one injury claimant

Real-time Appraisal / AI Loss Prediction

- During vehicle scan using app, the Collision Centre user inputs the vehicle mileage (could also have user input repair estimate)
- VIN/mileage based valuation is determined using recent "sold vehicle" database
- By comparing the Appraisal value to the Delta-V linked crash data severity repair estimate, predict: Total Loss or Repairable (repair > 80% valuation)

vehicle	The vehicle title (Make, Model, Year, Trim)	2005 Toyota Corolla LE
mileage	The mileage used to compute the market value	75248
count	The number of data points used for estimate	120
mean	The estimate average market price	7044
stdev	Standard deviation of prices	1276
certainty	The statistical confidence in the market value	99
period	The date range of the historical sales data used	["2015-06-27","2015-07-16"]
prices	The estimated average market, below market, and above market prices	{"average":7044, "below":5768, "above":8320}

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Repair Estimate AI: database

Current ability: can help flag fraudulently high estimates for further investigation

Industry data on claim severity (Mitchel / IIHS) provides KPIs for collision repair averages (benchmarks). Example: $3200 average repair cost

Benchmark data**:** uses IIHS damageability study data as benchmark (tests at 8 kph and 16 kph) Example of Delta-V versus Repair Estimate Data

Bumper performance in low-speed crash tests: vehicle repair costs

Make/model	Front full	Front corner	Rear full	Rear corner	Total damage
Saab 9-3	$1,476	$1,076	$1,722	$969	$5,243
Audi A4	$976	$2,038	$918	$1,899	$5,831
Lincoln MKZ	$1,001	$1,966	$2,330	$669	$5,966
BMW 3 series	$3,658	$1,256	$989	$778	$6,681
Acura TSX	$1,693	$1,274	$3,430	$1,157	$7,554
Volvo S60	$4,517	$543	$2,142	$1,022	$8,224
Lexus IS	$4,695	$2,223	$1,922	$737	$9,577
Lexus ES	$3,921	$2,093	$3,709	$1,101	$10,824
Mercedes C class	$5,486	$963	$3,728	$877	$11,054
Acura TL	$4,985	$1,244	$3,814	$1,156	$11,199
Infiniti G35	$5,223	$3,544	$4,035	$1,181	$13,983

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Repair Estimate AI: Delta-v & Model

AI factored inputs:

- Longitudinal (front/rear) delta-v
- Lateral (side) delta-v
- Combo delta-v (lateral and longitudinal)
- Valuation Estimate
- IIHS damage repair costs (crash tests)
- Proprietary Database (like HLDI claim severity by vehicle model)

Highway Loss Data Institute

Collision Damage with other lines included

By Make and Model 2011-2013 Models

Sourced Date: September 2015

Legend: Better than average; Average; insufficient data available

Vehicle	Size	Model	Collision	Property damage	Compre-hensive	Personal injury	Medical payment	Bodily injury
Porsche Boxster convertible	SMALL	SPORTS CARS			97			
AVERAGE OF	SMALL	SPORTS CARS	152	68	116	68		
Chevrolet Sonic	SMALL	STATION WAGONS/MINIVANS	84	95	93	120		110
Ford C-Max hybrid	SMALL	STATION WAGONS/MINIVANS	91	71	98	104	83	
Ford Focus	SMALL	STATION WAGONS/MINIVANS	105	92	94	95	108	108
Kia Forte	SMALL	STATION WAGONS/MINIVANS	92	101	88	127		126
Kia Soul	SMALL	STATION WAGONS/MINIVANS	95	93	85	120	138	106
Mazda 3	SMALL	STATION WAGONS/MINIVANS	97	88	80	86	89	92
Mazda 3 Mazdaspeed	SMALL	STATION WAGONS/MINIVANS		86	124	87		
Mini Countryman 2WD	SMALL	STATION WAGONS/MINIVANS	82	77	88	72	75	
Mini Countryman 4WD	SMALL	STATION WAGONS/MINIVANS	86		99	72		
Nissan Cube	SMALL	STATION WAGONS/MINIVANS	104	98	116			111
Scion xB	SMALL	STATION WAGONS/MINIVANS	87	90	101	124	115	98
Scion xD	SMALL	STATION WAGONS/MINIVANS	97	100	75			86
Subaru Impreza 4WD	SMALL	STATION WAGONS/MINIVANS	100	71	115	84	92	87
Subaru Impreza WRX 4WD	SMALL	STATION WAGONS/MINIVANS		75		72		70
Subaru XV Crosstrek	SMALL	STATION WAGONS/MINIVANS	78		107	88		78
Suzuki SX4 2WD	SMALL	STATION WAGONS/MINIVANS	129		128			
Suzuki SX4 4WD	SMALL	STATION WAGONS/MINIVANS	152	91	115			
Toyota Matrix 2WD	SMALL	STATION WAGONS/MINIVANS	106	86	78			
Toyota Matrix 4WD	SMALL	STATION WAGONS/MINIVANS	79					
Toyota Prius V hybrid	SMALL	STATION WAGONS/MINIVANS	103	81	106	91	86	93

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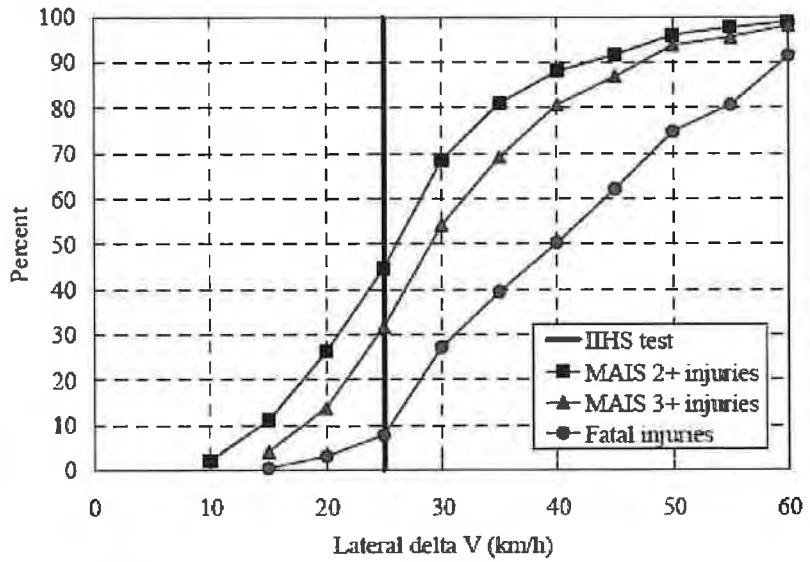
Real-time Injury Risk AI

AI factored inputs:

- Longitudinal (front/rear) delta-v
- Lateral (side) delta-v
- Combo delta-v (lateral and longitudinal)
- Valuation Estimate
- IIHS damage repair costs (crash tests)
- HLDI claim severity by vehicle model



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Collision Sciences "Black Box" Technology

The existing technology is the Bosch Crash Data Retrieval Tool, which covers a wide range of vehicles. Other manufacturers, such as Hyundai/Kia and a few others have their own proprietary scantool, which we would implement as a next step, so as a further competitive advantage, our tool would be fully universal.

Our technology presents improvements over the existing technologies (OEM scan tools) because our solution:

- uses inexpensive hardware ($120 as opposed to $5000)
- has no software license (Bosch charges $1200/year)
- is cloud-connected, enabling real-time reporting to 3rd party systems
- utilizes additional databases for Artificial Intelligence, providing the end-user more context when trying to understand, interpret and analyze the context of the scientific accident data

Opportunity & Approach

Would you like to see Crash Data Reports offered through the ISB Canada Order Center?

Data Capture Approach:

New directive to have tow operators, or collision centres and the collision reporting centres routinely preserve crash data using new inexpensive tool would make ISB Canada a "Crash Data Report" repository. ISB Canada can also facilitate logistical shipping of modules/adapters.

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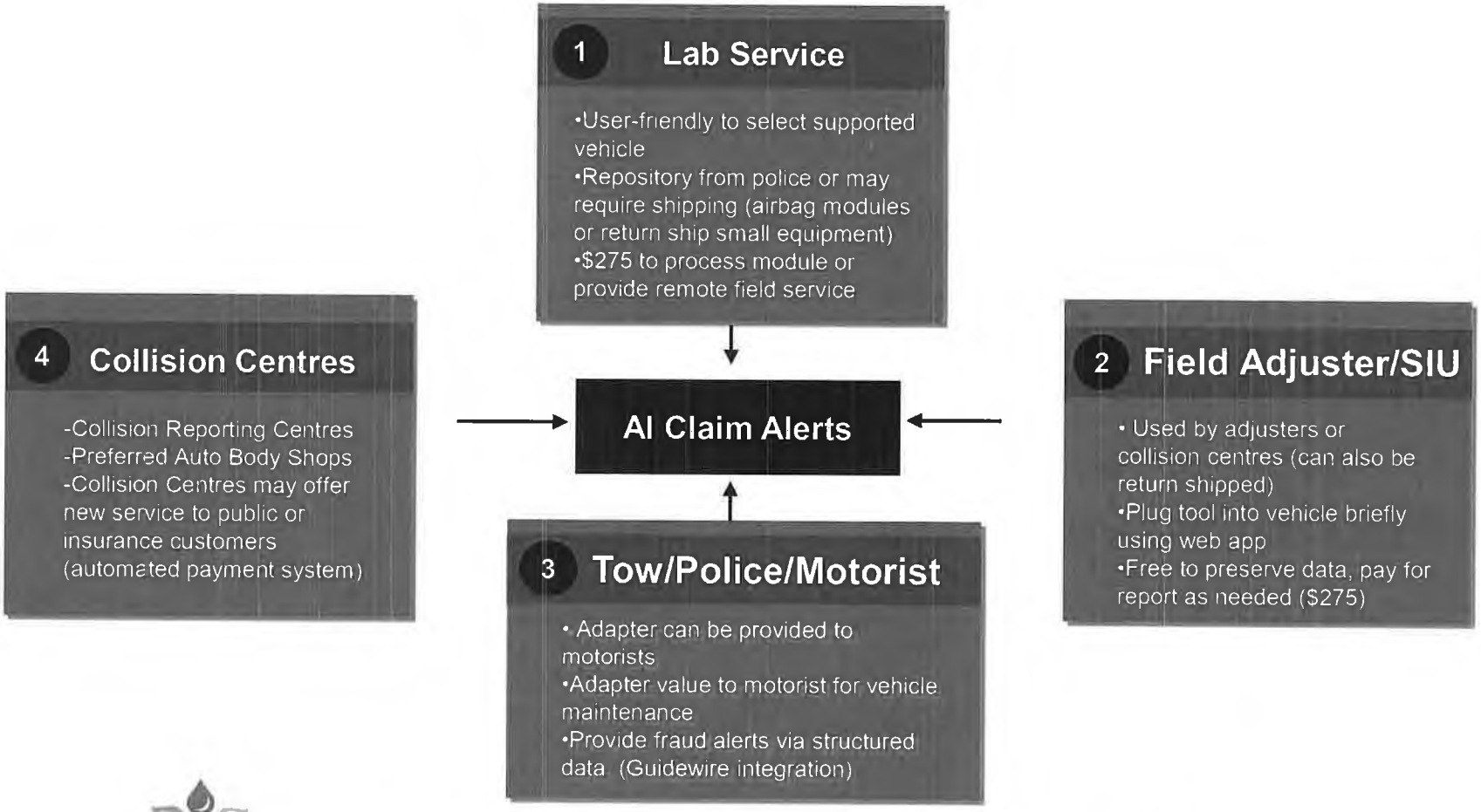
Data Capture Options

New, cheaper, scalable ways to preserve crash data



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Value Proposition

Reduce Claim Cycle times with scientific claim validation (Ex. repair cost estimates, injury duration, CRC or police report statements)

Real-time picture on exposure (reserve management)

Detect and prevent more fraud (1.5 billion annual issue in Ontario)

Cost savings as opposed to hiring an expert engineer at a value of $1000 or more per claim

Using crash data as evidence of driver contributory negligence, insurers can potentially reduce 3rd party liability claim payouts and expenses by 20-30%

Service Value & Pricing

Accessible and cost-effective Crash Data evidence preservation. Insurers already secure Crash Data evidence using engineers. New solutions make it cost-effective to preserve crash data for every accident claim.

Preserve evidence for free. Pay for reports as needed ($275).

Optional: Real-time Risk AI

See full explanation on our website: https://collisionsciences.ca/Edr-report-cost

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Resources on CollisionSciences.ca

3rd Party Demand Letter. Generate a sample vehicle-specific Evidence Preservation letter to have a 3rd Party preserve an airbag module. This tool could be routine for new MVA cases, enabling expedited Demand letter preparation. The letter includes the vehicle module location, generated from our database.

Public e-Checkout. Direct your MVA clients to our website. They can get information on preserving their involved vehicle's airbag module on their own, and arrange to ship it to our lab through our e-commerce checkout if a report is needed. We can also provide you a table tent for your office to notify clients about our service.

Online Evidence Logistics Platform. We developed a free online platform where you can register to schedule preservation or manage reports on behalf of your clients, using evidence best practices. An order facilitates shipping of airbag modules to our central Crash Data Lab by automatically emailing: instructions (in the form of a notice to preserve evidence letter), a CofC evidence tracking form, and a shipping label. The vehicle contact will likely be a collision centre. Many collision centres are registered partners and earn $75. For less severe collisions, we can return ship equipment to the vehicle contact.

Car Adapter and Mobile App. Like having an engineer in your pocket, use our free Android mobile app, with an inexpensive under-dash car adapter to save crash data to the cloud. We can return-ship the adapter for an order, or you can buy one for $100 and routinely save data to your cloud account for free. We are finalizing vehicle support and accepting beta users. You can sign up

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Tech Overview

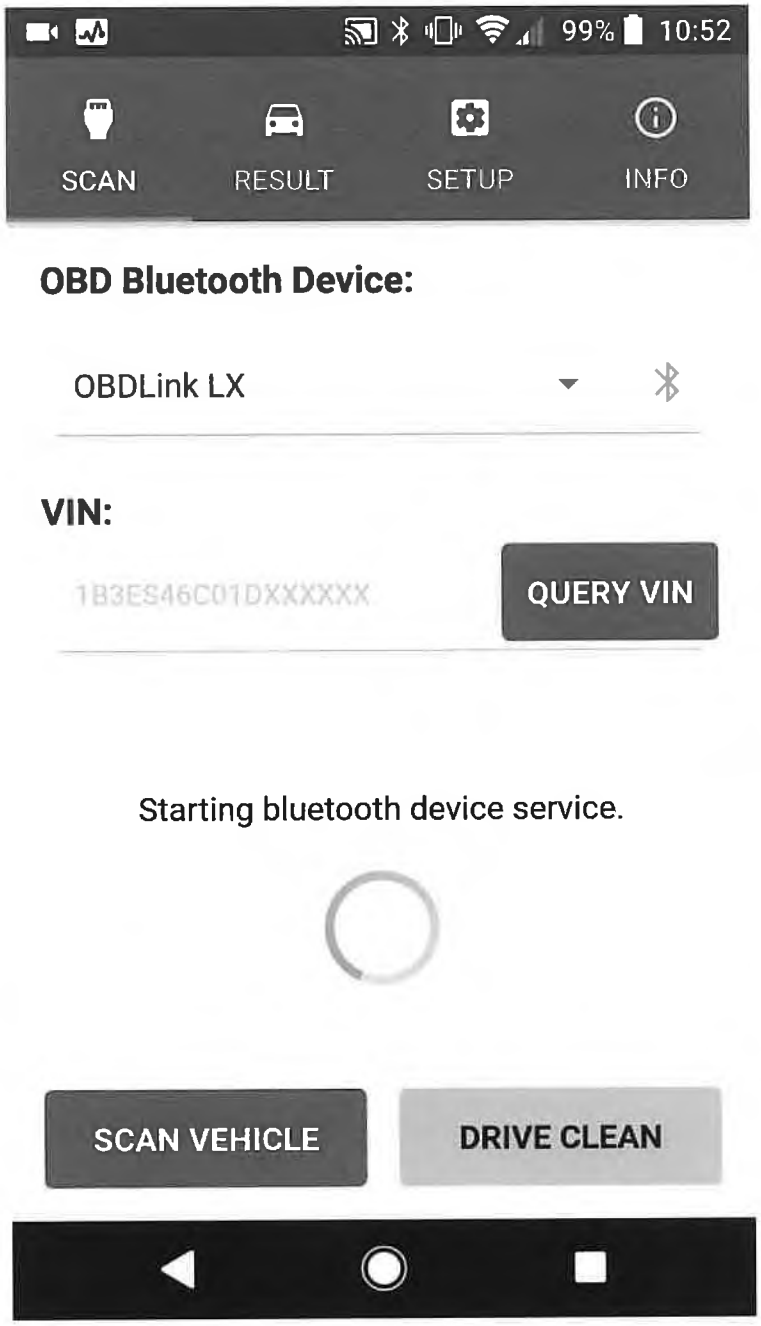
1. Ability to Collect Crash Data from the vehicle (app/adapter)

Live App Demo

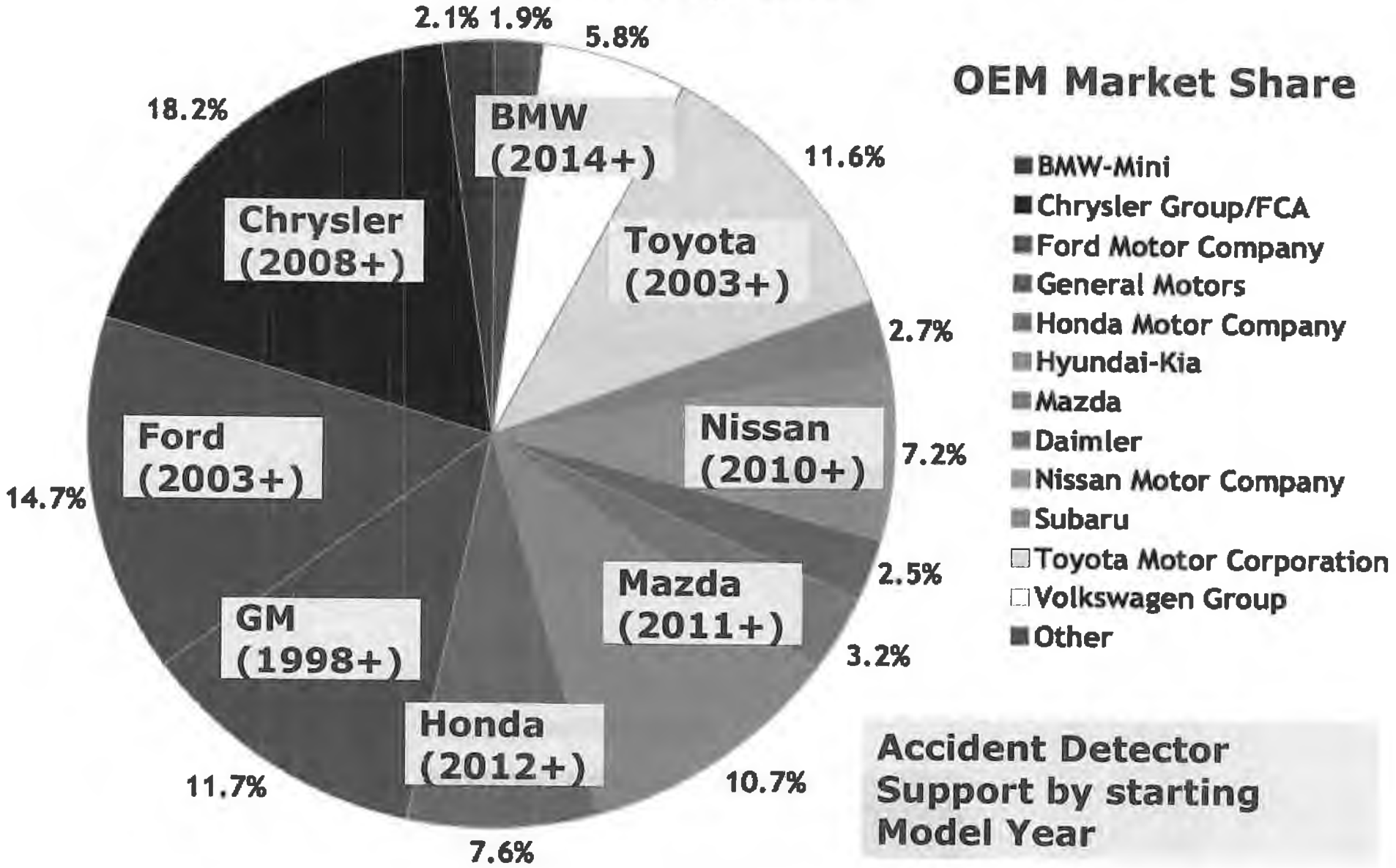
APP supports 90% of vehicles that are supported by Bosch tool!

Over 3000 unique year/make/models are supported, including most:

Toyota/Lexus/Scion(2003+), Chrysler/Dodge/Jeep/Fiat(2006+), Buick/Cadillac/Chevrolet/GMC/Hummer/Oldsmobile/Pontiac/Saturn(2002+), Ford/Lincoln/Mercury(2001+), Honda/Acura (2015+), Nissan/Infiniti(2012+), Mazda(2012+), BMW(2013+), Volkswagen(2015+), Audi(2015+), Mercedes(2014+), RAM(2010+), MINI(2014+).


99% 10:52
SCAN
RESULT
SETUP
INFO
OBD Bluetooth Device:
OBDLink LX
VIN:
1B3ES46C01DXXXXXX
QUERY VIN
Starting bluetooth device service.
SCAN VEHICLE
DRIVE CLEAN

Auto Manufacturer Market Share In Canada
January 2015



Tech Overview

2. Ability to analyze crash data in real-time (Python AI cloud server)

Total Loss Prediction (Repair Estimate & Appraisal)

Injury Severity Prediction (Whiplash, AIS)

> Toyota/Lexus/Scion(2003+), Chrysler/Dodge/Jeep/Fiat(2006+), Buick/Cadillac/Chevrolet/GMC/Hummer/Oldsmobile/Pontiac/Saturn(2010+), Ford/Lincoln/Mercury(2010+), Honda/Acura (2015+), Nissan/Infiniti(2012+), Mazda(2012+), BMW(2013+), Volkswagen(2015+), Audi(2015+), Mercedes(2014+), RAM(2010+), MINI(2014+).

Utilized NHTSA ftp site to decode 1000s of Crash Data Reports

WIP: old Ford/GM vehicles

Google Sheets: Live AI Project Status

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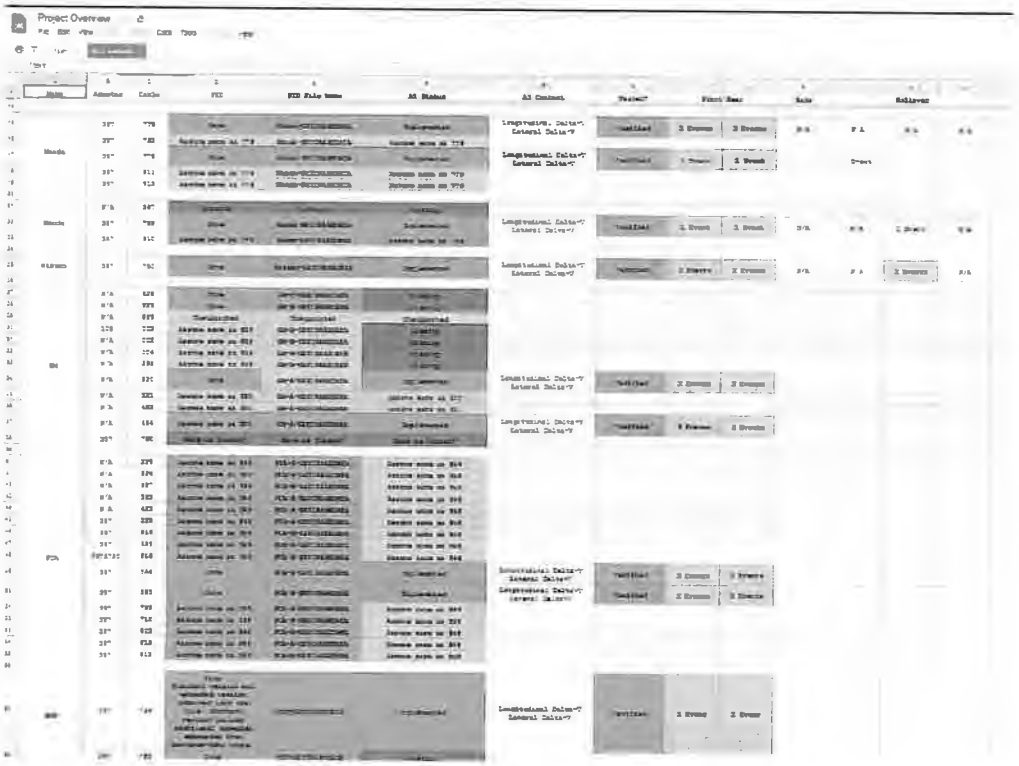
AI Project Overview: Severity Complete

Pre-impact alerts (completion roadmap: June 2018)



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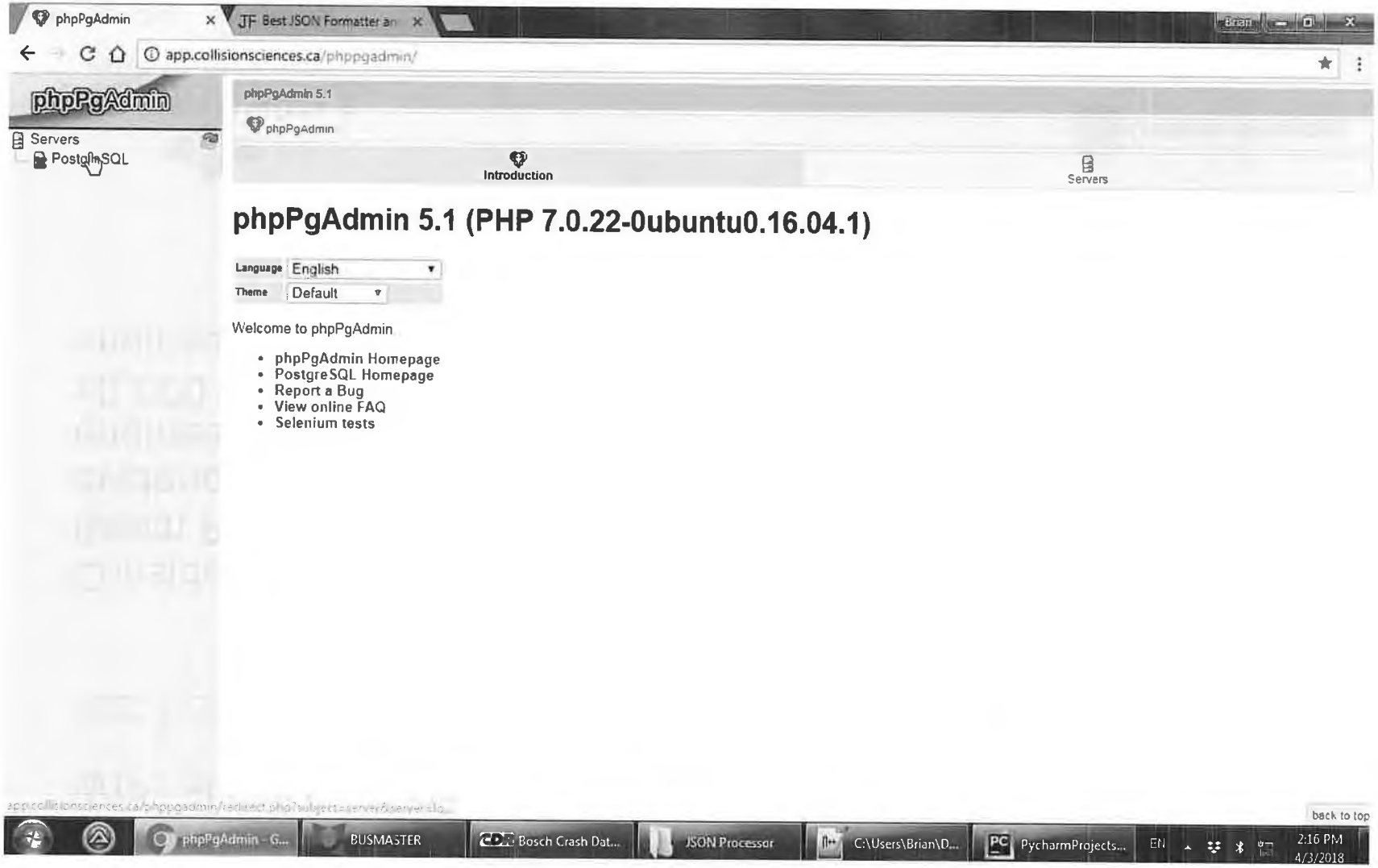
Tech Overview

3. Ability to Replay the raw crash data into Bosch CDR Tool

WIP: old GMs on VPW protocol

See live video of Raw Data fed into Scan Tool

Consider that the value proposition of this tech is access to the Bosch PDF reports, providing access to anti-fraud and liability evidence that would otherwise cost TD $1000 to $3000 in engineering fees per use. The value of routinely using our tool on x0,000 claims would otherwise cost $10 to 20 million in engineering fees.



ONLINE LINK: See live video of Raw Data fed into Scan Tool

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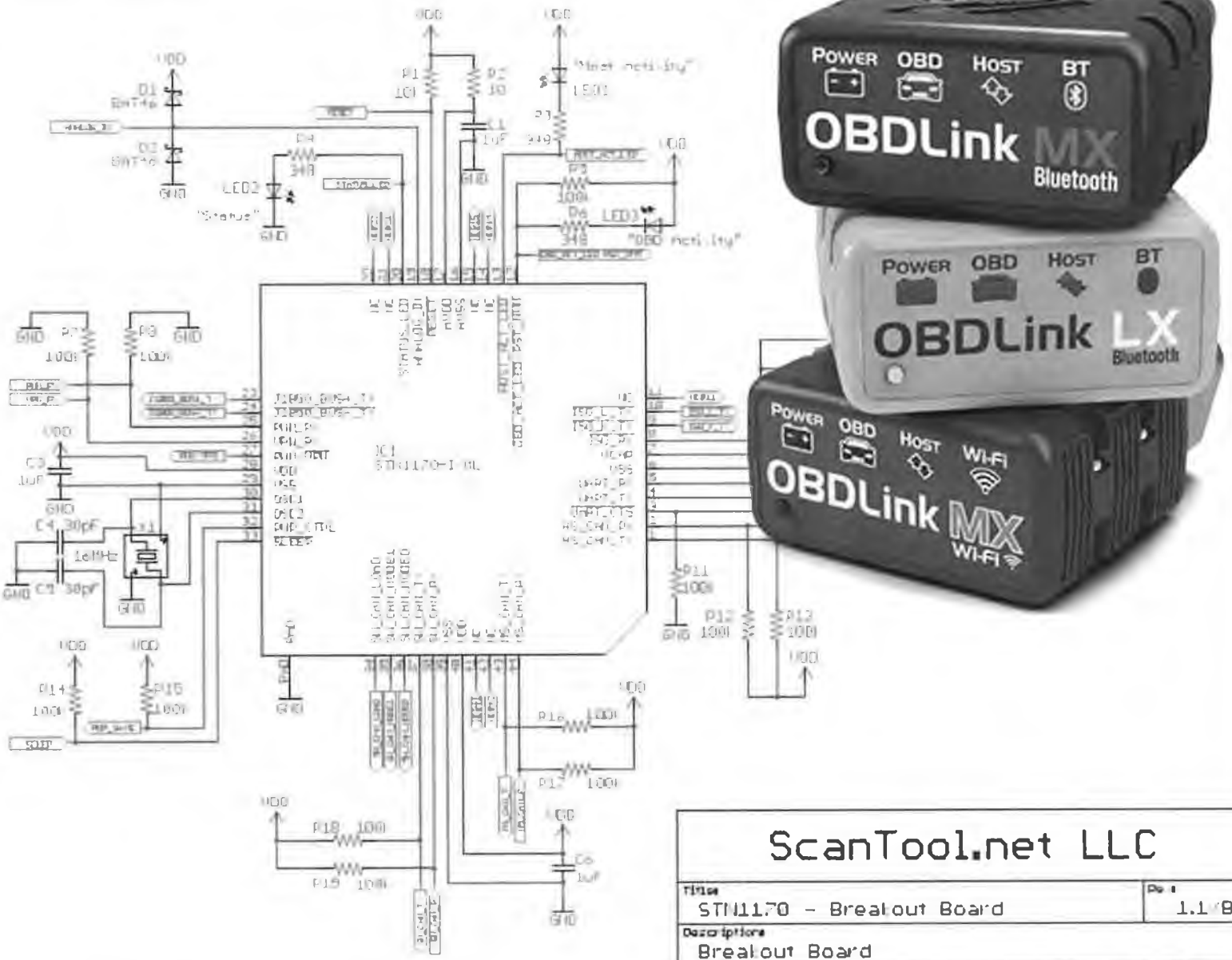
Main Controller



ScanTool.net LLC	
Title: STN1170 - Breakout Board	Rev: 1.1/8
Description: Breakout Board	
Date: 9/17/2013 12:04:33 PM	Sheet: 1/2

Android App & OBDLink adapter

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VIN Testing (Simulated 3000 unique models)

VIN Database for Mazda

File Edit View Insert Format Data Tools Add-ons Help Last edit was made 4 days ago by Brian Chang-Yun Hsu

Year

Year	Make	Model	VIN	CDR Test (OK/NG)	Group	20180112 Test
2016	Mazda	CX-3	JM1DKBC76G0103059	OK	C	Worked after putting in correct part number
2016	Mazda	CX-5	JM3KE2DY5G0601458	OK	A	
2016	Mazda	CX-9	JM3TCBDY2G0122151	NG	VIN Unsupported	
2016	Mazda	Mazda2	MMODJ2HAA0W214905	NG	Invalid VIN	
2016	Mazda	Mazda3	3MZBM1K79GM259555	OK	A	
2016	Mazda	Mazda5	JM1CW2CL7G0192024	OK	B	
2016	Mazda	Mazda6	JM1GJ1W5XG1471257	OK	A	
2016	Mazda	MX-5	JM1NDAD78G0102518	OK	C	Worked after putting in CX-3 part number
2015	Mazda	CX-5	JM3KE2BE0F0545405	OK	A	
2015	Mazda	CX-9	JM3TB3BA0F0453923	OK	B	
2015	Mazda	Mazda3	3MZBM1U72FM190641	OK	A	
2015	Mazda	Mazda5	JM1CW2CL5F0188620	OK	B	
2015	Mazda	Mazda6	JM1GJ1W61F1163272	OK	A	
2014	Mazda	CX-5	JM3KE2DY2E0301020	OK	A	
2014	Mazda	CX-9	JM3TB3DV9E0432017	OK	B	
2014	Mazda	Mazda2	JM1DE1KZ5E0178708	OK	A	
2014	Mazda	Mazda3	JM1BM1W39E1112351	OK	A	
2014	Mazda	Mazda5	JM1CW2BL0E0171126	OK	B	
2014	Mazda	Mazda6	JM1GJ1U64E1118795	OK	A	
2013	Mazda	CX-5	JM3KE2DEXD0123314	OK	A	
2013	Mazda	CX-9	JM3TB2BA6D0403163	OK	B	
2013	Mazda	Mazda2	JM1DE1KZ4D0153040	OK	A	
2013	Mazda	Mazda3	JM1BL1V76D1706613	OK	B	

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Servers/Databases (AWS, Dedicated Server)

- **Secure (Cloudflare Web Application Firewall, Advanced DDoS Protection)**
- **High Availability, and Platform/Database has been load tested**
- **Database below shows collected data for a range of vehicles/protocols**

app.collisionsciences.ca/phppgadmin/

ion Sciences | Logins | AWS | phpPgAdmin | LinkedIn | modules | fmovies | Account User Login | Admin | Quora | ManyChat

PostgreSQL 9.5.10 running on localhost:5432 – You are logged in as user "cdr"

phpPgAdmin: PostgreSQL: cdr: public: cdr_data:

Browse

Actions	id	date_created	date_modified	vin	make	cdr_data
Edit Delete	138	2018-01-13 23:31:26.432823	2018-01-13 23:31:26.432823	3N1CE2CP3GL354405	Nissan	{"items": [{"request": [16, 129], "response": [80...
Edit Delete	142	2018-01-16 22:51:19.500399	2018-01-16 22:51:19.500399	JTDKDTB32C1525677	Toyota	{"items": [{"response": [127, 164, 51], "request"...
Edit Delete	137	2018-01-13 20:36:45.287581	2018-01-13 20:36:45.287581	3MZBM1V70EM105177	Mazda	{"items": [{"request": [34, 217, 0], "response": ...
Edit Delete	139	2018-01-13 23:33:25.943913	2018-01-13 23:33:25.943913	1FAHP3M24CL364636	Ford	{"items": [{"response": [80, 3, 0, 50, 1, 244], "...
Edit Delete	143	2018-01-16 22:55:15.943165	2018-01-16 22:55:15.943165	JTDKDTB32C1525677	Toyota	{"max_long_accel": [8.96875, 2.2242499999999996],...
Edit Delete	140	2018-01-14 15:32:16.837205	2018-01-14 15:32:16.837205	2HGFB2F40FH007689	Honda	{"process_type": "P_GETCRASHDATA", "items": [{"re...
Edit Delete	141	2018-01-16 22:47:05.127473	2018-01-16 22:47:05.127473	JTDKDTB32C1525677	Toyota	{"items": [{"response": [127, 164, 16], "request"...
Edit Delete	144	2018-01-16 23:50:47.812452	2018-01-16 23:50:47.812452	JTDKDTB32C1525677	Toyota	{"items": [{"response": [127, 164, 16], "request"...
Edit Delete	134	2018-01-12 02:27:41.603247	2018-01-12 02:27:41.603247	2CNDL53F986333544	Chevrolet	{"process_type": "P_GETCRASHDATA", "items": [{"re...
Edit Delete	133	2018-01-11 18:44:03.515018	2018-01-11 18:44:03.515018	55SWF4KB2GU112453	Mercedes	{"items": [{"response": [98, 250, 17, 1, 0, 3], "...
Edit Delete	135	2018-01-13 17:32:14.871421	2018-01-13 17:32:14.871421	JM3KE2DY5G0601458	Mazda	{"process_type": "P_GETCRASHDATA", "items": [{"re...
Edit Delete	136	2018-01-13 19:55:57.32853	2018-01-13 19:55:57.32853	2HGFB2F40FH007689	Honda	{"items": [{"response": [80, 3], "request": [16, ...

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Toyota EEPROM Simulation Notes

Type	#	Regular Version	#	CAN Variation	#	Alternative
E0/03	1	05 A4 02 20 00 2E 05 A4 02 20 00 52 05 A4 02 08 00 72 05 A4 02 20 00 7A 05 A4 02 08 00 9A 05 A4 02 20 00 A4 05 A4 02 20 00 C4	7	05 A4 02 02 00 E2	13	Last command is A4 02 20 00 62
E0/07	2	05 A4 02 20 00 17 05 A4 02 20 00 20 05 A4 02 18 00 30 05 A4 02 20 00 3C 05 A4 02 18 00 4C 05 A4 02 20 00 58 05 A4 02 18 00 68	8	Should be 00 E6 (Does not exist)		
140/0D	3	05 A4 02 20 00 17 05 A4 02 20 00 20 05 A4 02 18 00 30 05 A4 02 20 00 3C 05 A4 02 18 00 4C 05 A4 02 20 00 58 05 A4 02 18 00 68 05 A4 02 20 00 E8 05 A4 02 0E 00 F8 05 A4 02 20 00 90 05 A4 02 20 00 A0	9	Should be 01 4C (Does not exist)		

Ad	Rq	Toyota K-Line Module EEPROM Data [1st, Most Recent] 2008 Toyota Prius EEPROM Data (Bold) [2nd, Most Recent, 1st]															
0	00	00	00	00	00	00	60	A8	30	01	A9	00	00	00	00	00	98
10	08	00	00	AA	D1	00	00	00	00	00	60	A8	30	01	A9	00	00
20	10	00	00	00	98	00	00	AA	D1	00	00	00	0A	00	00	00	00
30	18	00	00	FF	FF	00	80	00	00	A5	00	00	02	45	0A	FF	FF
40	20	AF	06	04	03	00	00	00	01	00	02	00	01	00	00	00	FF
50	28	00	FF	00	FF	00	FE	00	FF	00	FF	00	FF	00	FF	00	00
60	30	00	FA	00	01	00	00	00	00	00	00	00	00	00	00	00	00
70	38	00	00	00	00	00	00	00	00	9F	05	04	0C	00	07	00	0A
80	40	00	07	00	06	00	02	00	02	00	FE	00	01	00	FF	00	FF
90	48	00	FF	00	FF	00	00	00	02	00	FA	02	02	00	00	00	00
A0	50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
B0	58	00	**04**	**44**	**00**	**00**	**FE**	**00**	**00**	**00**	**00**	**00**	**01**	**00**	**FF**	**00**	**FE**
C0	60	**00**	**FF**	**00**	**01**	**00**	**00**	**00**	**FF**	**00**	**FF**	**00**	**00**	**00**	**FF**	**00**	**FF**
D0	68	**00**	**FA**	**00**	**04**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
E0	70	00	00	00	00	00	00	00	00								

Artificial Intelligence Calculation's

Event Storage Capability: 2 Front/Rear, 2 Side
Lateral Delta-V, Airbag ECU Sensor Not Found!

	Item	Calculation
	Pre-Crash Data Vehicle Speed	Convert to decimal, divide by 2, round down. 0x6C = 108; 108 x 0.5 = 54 km/hr
	Pre-Crash Data Accelerator Rate	Convert to decimal, multiply by 0.0392. 0x1A = 26; 26 x 0.0392 = 1.02
	Pre-Crash Data Engine RPM	Separate into two single-digits, multiply by 400. 0x33 = 0x3 and 0x3; 3 x 400 = 1200 RPM
C	Longitudinal Delta-V	Convert to decimal, multiply by 0.1375, round, negate. 0xFA = -6; -6 x 0.825 = -0.8; -(-0.8) = 0.8 km/hr
C	Longitudinal Delta-V	Convert to decimal, multiply by 0.1375, round, negate. 0x03 = 3; 3 x 0.1375 = 0.4125 = 0.4; -(0.4) = -0.4 km/hr
C	Lateral Delta-V, B-Pillar	Convert to decimal, multiply by 0.2070, round. 0x01 = 1; 1 x 0.2070 = 0.2070 = 0.2 km/hr
C	Lateral Delta-V, C-Pillar	Convert to decimal, multiply by 0.1375, round. 0x06 = 6; 6 x 0.1375 = 0.825 = 0.8 km/hr
C	Lateral Delta-V, B-Pillar	Convert to decimal, multiply by 0.2070, round. 0xFF = -1; -1 x 0.2070 = -0.2070 = -0.2 km/hr
C	Lateral Delta-V, C-Pillar	Convert to decimal, multiply by 0.1375, round. 0xFA = -6; -6 x 0.1375 = -0.825 = -0.8 km/hr

Electronic Evidence (Case Outcomes)

There is an even stronger likelihood in a civil action involving torts, such as injuries resulting from traffic accidents, that the failure to preserve crash data evidence will result in severe sanctions.

The US court of appeals in **Pries v Honda** has already acknowledged the material importance of preserving a vehicle in an accident case by stating, "the car itself may be the best witness about conditions at the time of the accident. Strong forces leave tell-tale signs in physical objects, signs that can be read by people who know what to look for and have the right instruments."

Applying this standard to the analysis of EDR evidence, "people who know what to look for" could be equated to qualified Crash Data Retrieval Analysts, while "have the right instruments" could be likened to an up-to-date Crash Data Retrieval Tool.

American Family Ins. Co. V Village Pontiac GMC is an example of sanctions against those parties who have failed to preserve motor vehicles and the material evidence contained therein. In this case, steps were not taken by the plaintiff to preserve the car for inspection. The car was subsequently destroyed by a salvage company. As a result, the appellate court barred all evidence, both direct and circumstantial, concerning the condition of the car, and granted summary judgment for the defendant. The court believed this was an appropriate sanction because the "plaintiffs intentionally allowed the most crucial piece of evidence [vehicle] in this case to be destroyed."

The above was a civil product liability case, but the spirit of the ruling could be applied to almost any case involving a motor vehicle accident, as the vehicle and its associated EDR crash data is almost always the most crucial piece of evidence.

Electronic Evidence (Obligations)

Most vehicle accident cases will involve electronic evidence, and though not easily accessible, airbag modules contain potential sources of electronic evidence.

Obligations pursuant to the Rules of Civil Procedure

As soon as litigation is reasonably anticipated, parties must consider their obligation to take reasonable and good faith steps to preserve potentially relevant electronically stored information.

Defensible preservation and collection

The Rules of Civil Procedure in Ontario and the relevant cases provide that the obligation to produce all documents relating to any matters in issue extends to electronic evidence.

The Sedona Canada Principles and Commentary on Preservation

Sedona Canada Principle 3 provides that "As soon as litigation is reasonably anticipated, parties must consider their obligation to take reasonable and good faith steps to preserve potentially relevant electronically stored information."

Published in 2008, the *Sedona Canada Principles* have become the standard employed by Canadian Courts with respect to e-discovery obligations.

Freedom of Information Act (Obligations)

According the Freedom of Information & Protection of Privacy Act, the public have the **right of notice and access to information**.

Commercial entities have duties and obligations to provide notice to the public where records of any kinds are concerned.

Interpretation of this Act would indicate there is responsibility for **collision centres** to inform the public that crash data evidence has been recorded to the vehicle's airbag module following a collision.
https://www.ontario.ca/laws/statute/90m56

The purposes of this Act are,

(a) to provide a right of access to information under the control of institutions in accordance with the principles that,

(i) information should be available to the public,

(ii) necessary exemptions from the right of access should be limited and specific, and

(iii) decisions on the disclosure of information should be reviewed independently of the institution controlling the information; and

"record" means any record of information however recorded, whether in printed form, on film, by electronic means or otherwise, and includes,

(a) correspondence, a memorandum, a book, a plan, a map, a drawing, a diagram, a pictorial or graphic work, a photograph, a film, a microfilm, a sound recording, a videotape, a machine readable record, any other documentary material, regardless of physical form or characteristics, and any copy thereof, and

(b) subject to the regulations, any record that is capable of being produced from a machine readable record under the control of an institution by means of computer hardware and software or any other information storage equipment and technical expertise normally used by the institution; ("document")

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Opportunity (Claims & Car Inspections)

Accident Claim Market: 1 million car accident claims/year (Canada), with a 50% injury rate (1500/day) i.e. approx. 460,000 injurious claims/year, and 120,000 personal injury lawsuits

Time constraint: window to preserve crash data is weeks (before vehicle is repaired/scrapped), though the window for injured parties to file a lawsuit is 2 years.

Usually there is no scientific evidence to prove what happened!

Claim cost to insurers: $1-$3 billion on fraud/annually, $5.1 billion on liability claims/year

Opportunity: Crash Data now exists on vehicles post-collision, use case:

Anti-fraud & Driver Negligence evidence. Example: typical legal case settlements/verdicts indicate claim payouts are reduced by 20-30% with proof of driver negligence (speeding, lack of a worn seat belt, inattentiveness). Online references

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Summary

Crash Data now exists, we make it accessible, affordable, customizable.

Control over the data enables real-time AI or even big data analysis (underwriting).

Crash data can provide proof:

Helps to battle fraud, reducing insurers costs by $100's of millions or even billions of dollars.

Claim Statistics (Appendix A)

Number of Accident Injury Claims and Civil Trials in Canada:

360,000 3rd party liability claims, 102,000 AB accident claims (no-fault)

120,000 personal injury lawsuits annually (Source IBC, Stats Canada).

Avg. accident claim: $15k; but 50% of costs due to 7% of claims ($15k to $3 million)

Claim cost to insurers:

$1-$3 billion on fraud/annually, $5.1 billion on liability claims/year

94% of Car Accidents are the "fault" of the driver (2016, NHTSA).

Thus, Crash Data can prove this fault, applicable in nearly EVERY ACCIDENT CASE. Through comparative or contributory negligence, driver fault can be used to reduce claim payouts by 25% to 40% (CanLII Case Decisions). Reducing claim payouts by 20% using negligence for all "at fault" drivers in Canadian accidents would amount to about 1.3 billion dollars annually. Co-operators (having about 5% market share) could potentially reduce 3rd party liability claim payouts by $65 million, and detect and prevent more fraud.

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Fraud & Liability References (Appendix B)

Statistics on Auto Insurance Fraud

Assess Claimant Credibility: compare crash data evidence to provided statements. A significant amount of insurance crime involves opportunistic fraud when individual policyholders make false or exaggerated claims.

- 35 percent of insurers estimated that insurance fraud costs represent 5-10 percent of their total claims, while 31 percent said the cost is as high as 20 percent. The website insurancehotline.com says an estimated 15 per cent of insurance premiums go toward covering fraudulent auto insurance claims. Private insurers wrote policies providing them with $21 billion in net written premiums for auto insurance in 2013. (Insurance Institute, www.iii.org/issue-update/insurance-fraud) So, at 15%, $21 billion* 0.15 = $3.15 billion, 5% is 1.05 billion. Types of fraud crash data can help identify: staged collisions, opportunistic injury claims

Reduce Claim Expenses and Settlement Amounts (CanLII Case Decisions Online references)

- If a vehicle was speeding, a claim payout can be reduced 25% to 40%
- If collision injuries are related to not wearing a seatbelt, the payout can be reduced by up to 25%
- Collision Severity (acceleration) data can reveal injury threshold/severity potential, if any
- Vehicle brake and accelerator pedal actions may help in liability or anti-fraud claims by comparing to narrative statements
- Crash data can be used in expert biomechanical analysis and accident reconstruction engineering analysis for liability

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GISA Claim Data, 2014 (Appendix C)

Third Party Liability

Urban

Size of Loss Range	2014			
	Generated Number Of Claims	Loss Amount	Expense Amount	Loss And Expense Amount
Less than $0	290	(671,054)	26,124	(644,930)
$0	12,152	0	4,315,306	4,315,306
$1 - $1000	16,598	10,658,998	984,173	11,643,171
$1001 - $2000	32,245	47,859,071	2,577,315	50,436,386
$2001 - $3000	30,727	76,496,982	1,751,266	78,248,248
$3001 - $4000	23,838	83,493,526	1,372,400	84,865,926
$4001 - $5000	21,221	95,202,538	2,179,425	97,381,963
$5001 - $10000	35,306	245,267,578	7,688,473	252,956,051
$10001 - $15000	10,840	131,547,395	2,581,975	134,129,370
$15001 - $20000	3,663	63,784,597	3,657,058	67,441,655
$20001 - $25000	2,137	48,337,299	1,562,256	49,899,555
$25001 - $30000	1,850	52,160,216	2,387,198	54,547,414
$30001 - $40000	2,119	73,422,485	9,188,921	82,611,406
$40001 - $50000	1,189	53,279,447	2,730,634	56,010,081
$50001 - $75000	1,353	82,791,141	6,083,487	88,874,628
$75001 - $100000	421	36,930,766	1,926,874	38,857,640
$100001 - $150000	364	44,598,211	2,419,589	47,017,800
$150001 - $200000	201	35,081,840	1,774,807	36,856,647
$200001 - $300000	135	33,301,999	1,286,398	34,588,397
$300001 - $400000	80	27,737,444	1,654,645	29,392,089
$400001 - $500000	42	19,240,919	839,889	20,080,808
$500001 - $750000	27	16,567,101	724,851	17,291,952
$750001 - $1000000	18	16,882,017	853,738	17,735,755
$1000001 - $2000000	21	26,186,506	1,253,364	27,439,870
$2000001 - $9999999	2	5,902,239	20,781	5,923,020
Total	196,839	1,326,059,261	61,840,947	1,387,900,208

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Insurance Bureau Canada (Appendix D)

Cost of claims for private passenger auto by type of coverage in $000, 1990 to 2013

	Third-party liability (includes DCPD where applicable)	Accident benefits	Collision	Comprehensive	Other*	Total
1990	2,035,794	645,327	476,248	789,050	100,197	4,046,616
1991	1,557,223	826,630	691,504	782,701	112,617	3,970,676
1992	1,690,892	955,247	615,656	771,711	100,816	4,134,322
1993	1,891,894	1,013,499	654,682	794,386	104,268	4,458,729
1994	1,806,506	1,584,715	657,289	779,563	106,716	4,934,789
1995	1,837,004	1,462,042	667,006	742,141	146,319	4,854,512
1996	2,013,193	1,495,155	668,769	738,010	159,174	5,074,301
1997	2,367,750	1,025,017	540,847	710,921	211,255	4,855,790
1998	2,648,619	1,174,782	576,312	730,939	261,981	5,392,633
1999	3,029,364	1,364,570	537,029	824,657	279,725	6,035,345
2000	3,293,198	1,628,708	577,213	959,353	334,561	6,793,033
2001	3,467,647	1,790,663	586,261	972,134	381,845	7,198,550
2002	3,712,502	2,131,356	569,504	1,061,477	418,893	7,893,731
2003	3,527,399	1,986,162	540,147	1,005,127	417,771	7,476,605
2004	3,213,330	1,725,651	485,367	929,963	405,027	6,759,338
2005	3,239,450	1,911,615	531,961	983,866	409,750	7,076,644
2006	3,463,661	2,215,820	531,452	1,059,306	413,706	7,683,945
2007	3,815,013	2,593,323	635,242	1,240,419	450,968	8,734,965
2008	3,883,328	2,890,887	661,816	1,260,983	462,995	9,160,008
2009	4,271,535	3,964,235	662,778	1,203,348	482,087	10,583,983
2010	4,483,186	3,944,857	747,534	1,154,333	479,061	10,808,971
2011	4,467,634	2,283,894	642,003	1,231,613	484,334	9,109,479
2012	4,678,721	2,090,991	785,157	1,242,909	456,980	9,254,758
2013	5,174,581	2,321,649	782,048	1,398,725	550,511	10,227,514

Sources: IBC Economic Trends, with data from GISA
Figures may not add up to 100% as a result of rounding
**Includes uninsured auto, underinsured motorist, all perils and specified perils*

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Statistics Canada (Appendix E)

Civil court survey, general civil cases by level of court and type of action

annual (number)

Data table | Add/Remove data | Manipulate | Download | Related information | Help

The data below is a part of CANSIM table 259-0013. Use the Add/Remove data tab to customize your table.

Selected items [Add/Remove data]

Geography = Canada [3]
Level of court = Total general civil court cases
Case unit = Total active cases [10]

Type of action	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Total general civil cases	606,912	604,423	613,622	596,093	597,575
Bankruptcy [11]	40,344	34,984	34,537	31,697	28,499
Collection [12]	48,126	45,861	43,456	42,217	42,018
Other contract [13]	86,568	82,543	80,938	77,657	75,792
Motor vehicle [14]	105,054	112,480	116,472	116,913	117,595
Other tort [15]	50,329	50,231	51,288	51,556	48,567
Probate [16]	29,572	29,280	33,650	33,258	37,644
Other civil action type [17]	158,816	163,913	161,984	151,093	153,206
Unknown type of action [18]	88,103	85,131	91,297	91,702	94,254

Statistics Canada (Appendix F)

PERCENTAGE OF DRIVER AND PASSENGER FATALITIES AND SERIOUS INJURIES WHERE VICTIMS WERE NOT USING SEAT BELTS 2010-2014

	2010	2011	2012	2013	2014
DRIVERS					
FATALITIES	34.0	31.4	31.8	32.0	26.2
SERIOUS INJURIES	12.9	12.9	12.6	11.7	11.8
PASSENGERS					
FATALITIES	40.4	34.1	36.6	30.7	33.2
SERIOUS INJURIES	20.5	20.9	20.0	18.5	17.7

Note: "Serious injuries" include victims admitted to hospital for treatment or observation.

COLLISIONS AND CASUALTIES 1995-2014

YEAR	COLLISIONS		VICTIMS		
	FATAL[1]	PERSONAL INJURY[2]	FATALITIES[3]	SERIOUS INJURIES[4]	INJURIES[5] (TOTAL)
1995	2,818	162,014	3,313	20,188	238,458
1996	2,740	153,944	3,129	18,734	227,283
1997	2,660	147,549	3,076	17,294	217,401
1998	2,583	145,615	2,919	16,410	213,319
1999	2,632	148,683	2,980	16,187	218,457
2000	2,548	153,290	2,904	15,581	222,848
2001	2,415	149,023	2,758	15,296	216,542
2002	2,583	153,832	2,921	15,894	222,665
2003	2,487	150,493	2,777	15,110	216,123
2004	2,438	145,150	2,735	15,572	206,104
2005	2,551	145,559	2,898	15,792	204,701
2006	2,586	142,517	2,871	16,044	199,976
2007	2,455	138,615	2,753	14,410	192,745
2008	2,193	127,571	2,431	12,851	176,394
2009	2,007	123,449	2,216	11,955	170,770
2010	2,021	123,615	2,238	11,796	172,081
2011	1,849	122,350[r]	2,023	10,940	167,741[r]
2012	1,837[r]	122,663[r]	2,079[r]	11,087[r]	166,479[r]
2013	1,731[r]	120,370[r]	1,951[r]	10,663[r]	164,493[r]
2014	1,667	110,500	1,834	9,647	149,900

1. "Fatal collisions" include all reported motor vehicle crashes that resulted in at least one death, where death occurred within 30 days of the collision, except in Quebec before 2007 (eight days).
2. "Personal injury collisions" include all reported motor vehicle crashes which resulted in at least one injury but not death within 30 days of the collision, except in Quebec before 2007 (eight days).
3. "Fatalities" include all those who died as a result of a reported traffic collision within 30 days of its occurrence, except in Quebec before 2007 (eight days).
4. "Serious injuries" include persons admitted to hospital for treatment or observation. Serious injuries were estimated from 1995 to 2014 because several jurisdictions under-reported these numbers.
5. "Total injuries" include all reported severities of injuries ranging from minimal to serious.

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NHTSA (Appendix G)

Table 2. Driver-Related Critical Reasons

Critical Reason	Estimated (Based on 94% of the NMVCCS crashes)	
	Number	Percentage* ± 95% conf. limits
Recognition Error	845,000	41% ±2.2%
Decision Error	684,000	33% ±3.7%
Performance Error	210,000	11% ±2.7%
Non-Performance Error (sleep, etc.)	145,000	7% ±1.0%
Other	162,000	8% ±1.9%
Total	2,046,000	100%

*Percentages are based on unrounded estimated frequencies
(Data Source: NMVCCS 2005–2007)

From: Jason from Collision Sciences [jbayley@collisionsciences.ca]
on behalf of Jason from Collision Sciences <jbayley@collisionsciences.ca> [jbayley@collisionsciences.ca]
Sent: 2/21/2020 10:06:16 PM
To: Philip Mammen [philip.mammen@farmersinsurance.com]
CC: larry.johnson@farmersinsurance.com
Subject: Re: Demo Meeting
Attachments: ManagementReport_2019-06-01_2019-06-30.pdf; EDR Cost-Benefit Analysis (Collision Sciences).pdf; Collision Sciences - Service_Value Slide Deck - Sample Report Examples.pdf

Hi Philip,

Just following up on your request for a phone discussion and more information about our solution. If your schedule permits, I have available for a call on the morning of Tuesday Feb. 25th or Wed. Feb. 26th.

Please note also that our firm will be attending and sponsoring the *Insurance Fraud Management* conference in Orlando this coming March 8-11, should you or any team members be attending, it would be a great opportunity to meet and discuss our solution.

To provide more detail about our products and services (and value), I'm attaching the following resources for your team's review:

- Service/Value Slide Deck, with sample use cases and report screenshots
- Cost-benefit document (includes an EDR Report Comparison (Bosch CDR vs CSI Claims)
- Sample Management Report, display data analytics, flags, and supports monthly invoicing

Below is a brief company and solution overview, and I've included some details about how our EDR solution is differentiated.

> Collision Sciences Inc. (CSI) is a global technology and information provider that enables insurance carriers and corporations significant financial and operational benefits through scaled access and intelligent application of vehicle "black box" pre-crash data, biomechanical injury severity risk data, diagnostic repair data, and reconstructed motor incident data. CrashScan is a universal, mobile-app-based EDR (Event Data Recorder) solution, and is the only "vehicle black box" market option that offers affordable hardware, included user training, dedicated client centric data collection, customizable cloud data analysis, strategic alerting and reporting, and engineering tech support for users. Our solution is unique for a number of reasons:

- affordable hardware, CrashScan even supports vehicles not supported by Bosch CDR (Hyundai, Kia, Jag-Land Rover coming soon)
- report format is easy to read, can save trained EDR users 4-6 hrs (multiple crash events, complicated EDR reports to interpret)
- free proactive data preservation (appraisers, shops), opportunity to be alerted by email (or Claim Centre) on flags
- reports are customizable and inclusive of additional aggregated data (full diagnostic health scan data (DTC meanings), recalls, safety information, vehicle specs, vehicle value, flags), and most notably, the occupant injury risk information for 1st and 3rd party (scanned vehicle and other vehicle), providing a Biomechanical Assessment (statistical, epidemiological data) which has proven value in claim negotiation (LVI, BI)
- we are capable of generating the "OEM" interpretation version of the report in our lab (i.e. Bosch CDR reports)

- we are working on an Accident Recon workup with calculations and raw data (an included supplemental report)
- report fees are inclusive of engineering support by phone/email (for answering general questions, support for field user troubleshooting, and helping users understand the data as it relates to the case)

I look forward to speaking or meeting with you soon.

Have a great weekend,

Jason Bayley, P.Eng.
Collision Sciences | CEO & Founder
M: +1 905 599 9899
www.collision-sciences.com | CrashScan™ on Android and iOS | EDR Vehicle Support

On Thu, Feb 13, 2020 at 1:47 PM Jason from Collision Sciences <jbayley@collisionsciences.ca> wrote:

Hi Philip,

Thanks for reaching out. I actually sent some information to Larry Johnson well, and will forward that email to you.

Our pricing is inclusive of significant service and engineering support, where we answer user questions, ensure users are successful in the field and also at the desk while interpreting the reports. And our product is very unique, the only option that offers a cloud solution with automated analysis, and the only universal tool for all vehicle makes. There is also a large difference in our reporting style from OEM EDR reports, making it much easier and faster for users to understand the data.

We have a few different business models, where in general we enable free proactive evidence preservation for use at scale, where reports can be strategically purchased on demand. Under a POC, we typically engage with the SIU under a subscription, where our reports are $300 USD. And we have a few 3rd party investigation firms that are equipped with our kits also (currently HUB Enterprises and Ethos Risk), meaning we can get to any vehicle in the USA on-demand.

I'm available for a call tomorrow (Friday) afternoon (3pm ET?) or I'm available Tuesday morning, 11am ET?

Jason Bayley, P.Eng.
Collision Sciences | CEO & Founder
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jbayley@collisionsciences.ca | www.collisionsciences.ca

On Thu., Feb. 13, 2020, 1:03 p.m. Philip Mammen, <philip.mammen@farmersinsurance.com> wrote:

Good afternoon,

I'm in charge of some of the vendors that we utilize at Farmers Insurance in the realm of special investigations.

I did have some questions in regards to the cost of your systems as we currently have EDR capabilities and may look to expand our reach further in the near future.

Would it be possible to set up a call to discuss your pricing on equipment and services?

Thank you.

Philip Mammen
Field Claims Manager
Centralized Support Zone
Special Investigations Unit

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